

United States Government

Department of Energy

Fernald Area Office

memorandum

SEP 12 1997

DATE: DOE-1414-97

REPLY TO:
ATTN OF: FEMP:Rast

SUBJECT: WASTE PROFILE SUBMITTALS

TO: Gary L. Pyles, DOE-NV

985

3-601.

In accordance with Section 2.0 of the Nevada Test Site Waste Acceptance Criteria (NTSWAC), please find attached five waste profiles for your review. The Department of Energy, Fernald Environmental Management Project (DOE-FEMP) requests a deviation to this submittal, as described in Section 3.8 of the NTSWAC, to the requirement of Section 2.1.1.1, Waste Profiles, for these profiles.

Specifically, DOE-FEMP requests the following waste streams, as defined in Revision 7 of the *FEMP Application to Ship Waste to the Nevada Test Site, April 30, 1996*, be accepted as waste profiles for review to support the annual assessment scheduled for October 13, 1997.

- ONLO000000006 (Low/High Grade Residues)
- ONLO000000010 (Radioactively-Contaminated Regulated Asbestos Material)
- ONLO000000011 (Thorium Residues and Waste Not Amenable to Sampling)
- ONLO000000012 (Thorium Residues)
- ONLO000000015 (Stabilized Treated Wastes)

The justification for this request is based upon the limited inventory of materials in each of these waste streams and the requirements for submittal of Waste Profiles. The inventories listed for these waste streams are limited to legacy waste. The total volume of waste listed for these waste streams is estimated at 3,000 m³. The NTSWAC would require the submittal of approximately 350 waste profiles for this minimal volume.

By approving this deviation, the performance objective of the disposal site would not be compromised and permit requirements would not be violated. The DOE-FEMP has shipped more than 250,000 ft³ of these wastes under the current application with minimal impact to the disposal site's performance assessment and no violations to permit.

The deviation is requested to remain in effect until the legacy waste inventories for these waste streams are packaged and shipped for disposal during Fiscal Year 1998. After these inventories are removed from the FEMP, the corrective action for the deviation will be to submit waste profiles for newly generated waste in accordance with Section 2.1.1.1.

Should you need additional information feel free to contact me at (513) 648-3138 or Michael L. West at (513) 648-5647.



David M. Rast
Waste Management

Attachments: As Stated

cc w/att:

N. Hallein, EM-42/CLOV
M. Ramirez, FDF/51
D.A. Thomas, FDF/46
M.L. West, FDF/35-1
AR Coordinator/78

Nevada Test Site Waste Profile, Revision 0

A. Generator Information

1. WCO Michael F. Ramirez Phone (513) 648-5668 FAX (513) 648-5701
 2. Technical Contact Dayne A. Thomas Phone (513) 648-5672 FAX (513) 648-5649
 3. DOE Contact David M. Rast Phone (513) 648-3138 FAX (513) 648-3077
 4. Facility Name Fernald Environmental Management Project
 Address P.O. Box 398704
 City Cincinnati State Ohio Zip 45239-8704
 5. EPA Identification Number OH6890008976

B. General Waste Stream Information

1. Waste Stream Identification Number ONLO000000006
 Profile Revision Number 99 Profile Revision Date 9/04/97
2. Title of Waste Stream Uranium Residues
3. Waste Category ☒ Low-Level ☐ Mixed Low-Level (Generated within Nevada only)
4. Generating Process Description
See Waste Stream Characterization Data Sheet Attached
-
- Process Description Continuation Page Attached ☒ Yes ☐ No
 Flow Diagram Attached ☐ Yes ☒ No
5. Estimated Rate of Generation ☒ One Time Only 1,000 m³
☐ Ongoing _____ m³/yr
6. Reason for Submittal (specify one)
☐ New Waste Stream
☐ Modification to Waste Stream Date Change Effective _____
☐ Terminate Waste Stream
☒ Profile for currently Approved Waste Stream
7. ☒ Yes ☐ No Does this waste stream require a WAC deviation? Attach information.

C. WASTE STREAM IDENTIFICATION NUMBER ONL0000000006

Low/High Grade Residues

1.0 Waste Type

Low Level Waste

2.0 Waste Description

A waste stream is defined as a waste which is categorized by similar characterization process and/or point of generation. The criteria used for evaluating candidate LLW for shipment to the NTS, excerpted from the FEMP Waste Characterization Plan, PL-3052(M-128), are described on the following pages.

2.1 Low/High Grade Residues

Residues are stored at the FEMP as a result of the production processes within the various FEMP plants or from other DOE facilities. These residues are divided into two subgroups: low grade and high grade residues.

Low grade residues generally contain between 0.01 percent to 20 percent U-238 by weight and 0.2 percent to 2.0 percent U-235 relative to total uranium. These residues consist of uranium oxides and fluoride mixed with a wide variety of other materials such as dirt, fibers, and process area items. Low grade residues comprise approximately 70 percent of this waste stream.

Low Grade Uranium Residues:

- Discard process residues
- Trailer cakes
- Waste slurries (dried)
- Raffinate
- Sump cake
- Dust collector residues
- Filter cakes
- Magnesium fluoride, MgF_2
- Items known to be contaminated with uranium residues (includes glass, plastic, paper, etc)

High grade residues are also generated or stored at the FEMP as a result of the production processes within the various plants or other DOE facilities. High grade residues generally contain between 20 percent to 99 percent U-238 by weight and 0.2 percent to 2.0 percent U-235 relative to total uranium. These residues contain impurities or are mixtures of several uranium compounds. High grade residues comprise approximately 30 percent of this waste stream.

Many of the high grade residues are intermediate products in the uranium metal production process which do not meet the quality requirements to allow continued processing, have no economic value and, therefore, are classified as LLW.

High Grade Uranium Residues:

- Uranium metal, such as top-crops and off-spec metal for remelt, typically recycled back into the high grade feed production process.
- Uranium tetrafluoride, UF_4 (off-spec green salt)
- Scrap uranium oxide, U_3O_8 (black oxide)
- Reject uranium trioxide, UO_3 (orange oxide)
- Items associated with high grade residues (including glass, paper, plastic, etc.)

No chemical treatment of high or low grade wastes will be completed prior to shipment for disposal. Physical treatment will be completed as required to remove free liquids. FEMP PT-0005 "Packaging Low Level Radioactive Waste (LLRW) in Drums for Offsite Disposal" and PT-0007 "Packaging Low Level Radioactive Waste (LLRW) for Shipment in Metal Boxes for Offsite Disposal" are used to ensure that no free liquids are present in residue waste packages.

The quantity of radioactive materials in low/high grade residue shipped to the NTS will be limited so that an infinite array of packages will remain subcritical. This quantity will be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, or by taking into account the actual materials in the waste which meet fissile packaging exceptions delineated in 49 CFR, Parts 173.453. Low/high grade residue shipped to NTS will be packaged to be excepted from fissile packaging requirements (see section 2.3.b of this waste stream).

2.1.1 WASTE STREAM CHARACTERIZATION DATA SHEET

2.1.1.1 Waste Stream No.: Q N L Q Q Q Q Q Q Q Q 6

1. Waste Description:

- a. Physical Characteristics: Dry solid residues from uranium metal production which generated top-crops, off-spec residues and metal for remelt, slurries sump cakes, filter cakes, dust collector residues, raffinate, and magnesium fluoride. Some decanting and absorbent addition (typically dicalite®) may be performed prior to packaging this material.
- b. Special Handling/Disposal Requirements:
This material has an average radioactive level on contact of 2.0 mrem/hr. with a range of <0.5 mrem/hr. to 10.0 mrem/hr. Time, distance, and shielding techniques should be employed to reduce exposure.

2. Basis for Characterization:

- a. Process Knowledge: b. Analytical Knowledge: c. Both: ✓

If b or c, provide Standard Data Reporting Forms as necessary.

NOTE: Waste characterization of materials included in this waste stream is completed using a combination of sampling and analysis and process knowledge. Process knowledge is used when the material meets one or more of the criteria of NVO-325 (Rev. 1), Section 4.1.1.A, B, and C, or when process controls are well documented and controlled. (Examples of materials characterized by process knowledge includes residues generated from well controlled, well documented processes such as MgF_2). The FEMP will conduct confirmatory sampling of waste streams characterized by process knowledge before shipping for disposal at the NTS.

3. Radioactive Characteristics:

- a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)? No
- b. WMIS Nuclide Category (circle): 1 2 3 4 5 NA 7 8
(Choose the highest predominate nuclide. The number 6 is not an option.)

c. Radioactive Constituents:

Specific Activity Range of Waste Stream

<u>Nuclide</u>	<u>Chemical Forms</u>	<u>Low</u>	<u>Mean</u>	<u>High</u>	<u>Units</u>
(1) U-238	•	3.4E-07	6.6E-05	3.3E-04	Ci/kg
(2) U-236	•	0.0	6.4E-06	4.0E-05	Ci/kg
(3) U-235	•	4.3E-09	2.7E-06	2.1E-05	Ci/kg
(4) U-234	*	1.4E-07	6.0E-05	4.3E-04	Ci/kg
(5) Tc-99	oxides	0.0	1.7E-06	1.0E-05	Ci/kg
(6) Np-237	oxides	0.0	3.1E-08	5.4E-07	Ci/kg
(7) Pu-238	oxides	0.0	9.4E-09	2.0E-07	Ci/kg
(8) Pu-239	oxides	0.0	6.9E-08	1.6E-06	Ci/kg
(9) Pu-241	oxides	0.0	2.0E-06	4.5E-05	Ci/kg
(10) Sr-90	oxides	0.0	1.0E-07	6.0E-07	Ci/kg

• Uranium oxides and salts (typically UO_3 , U_3O_8 , and UF_6)

NOTE: The activities presented on this Waste Characterization Data Sheet were obtained by a weighted average of sub-waste streams of ONL0000000006 to determine the "Mean" and by reporting the maximum activities observed or derived for individual samples among the sub-waste streams for the "High." **NO RELATIONSHIPS BETWEEN THE ISOTOPES ARE IMPLIED OR CAN BE ASSUMED FROM THESE REPORTED ACTIVITIES.** (The sub-waste streams are: low grade/depleted, high grade/depleted uranium metal, high grade/depleted residues, and low grade/enriched residues.)

4. Hazardous Components (for MW): **NOT APPLICABLE**

a. Basis for Identifying as MW (circle):

(1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

<u>EPA Hazardous Waste Number</u>	<u>Chemical Name</u>	<u>Treatment Performed</u>	<u>Regulatory Threshold/Treatment Standard</u>
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(1)

(2)

2.2 Waste Stream Specific Criteria

2.2.1 Low Level Waste

Only the low/high grade residues defined as LLW per DOE Orders 5820.2A, 5400.1, and 5480.11 guidelines shall be shipped to the NTS. (NVO-325 (Rev.1), 5.5.1).

Compliance Method In general, wastes that originate from Controlled Areas at the FEMP are considered radioactive waste unless demonstrated otherwise through analysis or administrative controls. Further guidance on radioactive waste characterization is provided in the DOE Performance Objective (Draft). In accordance with the "Waste Minimization and Pollution Prevention Awareness Plan," the FEMP attempts to minimize waste generation whenever possible.

2.2.2 Transuranic

The low/high grade residues shall have a TRU concentration less than 100 nCi/g (e.g., shall not be regulated as TRU waste). (NVO-325 (Rev.1), 5.5.1.1(A)).

Compliance Method MC&A records indicate there are no materials at the FEMP with TRU concentrations above the 100 nCi/g level. The high grade enriched nuclear material (which is not currently included in this waste stream but may be declared waste in the future) contains the highest levels of TRU isotopes. The highest concentration for any single TRU isotope in material in this waste stream is estimated at 1.6 nCi/g and the sum of the highest detected levels of Np-237 + Pu-238 + Pu-239/240 + Am-241 = 2.8 nCi/g.

2.2.3 Hazardous Waste

All low/high grade residues shall be evaluated for hazardous waste by process knowledge, analytical characterization or by identifying material(s) listed as hazardous in Title 40 CFR 261, "Identification and Listing of Hazardous Waste," or in the regulations of the state where the waste is generated. (NVO-325 (Rev.1), 5.5.1.1(B)).

Compliance Method The general procedure for the evaluation of a residue for hazardous waste characteristics is as follows:

- (1) WCS is contacted by the generator of the waste for existing data/information obtained from previous evaluations;
- (2) If no information is available and characterization is required, Section I of the MEF is completed and submitted to WCS for characterization (EW-0001);
- (3) WCS completes characterization by process knowledge and sampling/analysis:
 - (a) Process knowledge is used by obtaining available information about the waste generation process so that WCS can establish that the waste does not exhibit hazardous waste characteristics and does not contain any listed hazardous waste.

- (b) Sampling and analysis will be performed according to a Sampling and Analysis Program which specifies the type and frequency of the sampling. The FEMP Sampling and Analysis Program approval process is described in a DOE/NV memorandum, Fernald Environment Management Project Low Level Waste Sampling and Analysis Program Review, received at the FEMP April 21, 1993. The quality of the process knowledge is a major factor in the selection of a SAP. WCS will:

- specify the parameters to be determined,
- write a specific sampling plan,
- specify the approved SOP to be used (e.g., for waste sampling, 20-C-806),

NOTE: All FEMP SOPs are issued as site controlled documents after the SOP has been through a review and approval process. The reviewers are selected by the SOP author based on the nature of the SOP.

- submit samples to an analytical laboratory following chain-of-custody procedures and complete analysis per SW-846 Methodology,
- complete a statistical analysis and quality assurance check on the analytical data following EW-0010, "FEMP Data Validation Procedure," and
- document the final characterization on the MEF.

- (4) A copy of the MEF is returned to the generator of the waste in question.

The generator will package the nonhazardous waste that meets the criteria of this application. FERMCO Quality Control oversees the packaging to ensure that only material specified in the MEF is packaged.

2.2.4 Free Liquids

The low/high grade residues disposed at NTS waste management sites shall contain as little free liquids as is reasonably achievable, but in no case shall the liquid equal or exceed 0.5 percent by volume of the external waste container and shall meet the NVO-325 (Rev.1), 5.5.1.1(C) criteria.

Compliance Method Low/high grade residues may be evaluated based on process knowledge or waste testing to determine whether the waste stream meets the free liquid criteria. Determinations based on process knowledge generally include a visual inspection as directed by PT-0007, "Packaging LLRW in Metal Boxes for Off-site Disposal."

Free liquid determinations are generally completed as part of the RCRA waste characterization process. Following EW-0001, "Initiating Waste Characterization Activities Using the MEF," free liquid is addressed on page 2 of the MEF's Requestor Section, C. Physical Characteristics, 3. Contains Free Liquids. The PFLT test is performed to determine the presence of free liquids when

process knowledge does not yield sufficient information to complete this determination. Reference FEMP Waste Characterization Plan, PL-3052(M-128).

In the event that free liquid is detected, the container is segregated, opened, drained, and repacked in accordance with 20-C-640, "Liquid Removal from Containerized LLRW" and/or sufficient absorbent is added to meet this WAC.

The containerized low/high grade residue wastes are protected from the elements during storage to minimize any contact with water in accordance with PT-0003, "Control and Movement of Containers at the FEMP."

2.2.5 Particulates

Wastes containing greater than 1 weight percent fine particulate materials less-than-ten-micrometer-diameter or 15 weight percent less-than-200 micrometer diameter particles shall be immobilized or packaged in accordance with NVO-325 (Rev.1), 5.5.1.1(D).

Compliance Method Some residue waste streams will categorically fail the particulates WAC while others may require testing to complete a rigorous evaluation. For example; some dust collector residues (MTC 062) have been documented to have greater than one percent by weight of less-than-ten-micron-diameter particles. In addition, depending on the moisture content, many of the residues on-site will fail these limits. If the waste form potentially may not meet the WAC as indicated on part C., Physical Characteristics, 2. Phase of the Requestor Section of the MEF (EW-0001), the waste will be identified as requiring testing. Testing may be conducted using a particle size impactor or some other form of particle sizing equipment. Should the waste fail the criteria for particulates and immobilization is impractical, the waste packaging will be completed by overpacking, using steel drums with 6 mil plastic liners or steel boxes, following the task order and/or procedures PT-0005 and PT-0006, in accordance with NVO-325 (Rev.1).

2.2.6 Gases

Gases shall be stabilized or absorbed so that pressure in the waste package does not exceed 1.5 atmospheres at 20° Celsius. Compressed gases as defined by Title 49 CFR 173.300, including unpunctured aerosol cans, shall not be shipped for disposal in the low/high grade residues Waste Stream. Aerosol cans shall have puncture disfigurements readily recognizable by real-time-radiography. Expended gas cylinders shall have the valve mechanism removed. (NVO-325 (Rev.1), 5.5.1.1(E)).

Compliance Method Low/high grade residues are evaluated to determine if they contain any items that potentially fail this WAC during the hazardous waste determination in the process of completing the MEF (EW-0001). Residues that fail to meet this WAC will not be shipped to the NTS.

2.2.7 Stabilization

Where practical, low/high grade residues waste shall be treated to reduce volume and provide a more structurally and chemically stable waste form. (NVO-325 (Rev.1), 5.5.1.1(F)).

Compliance Method WCS will identify all LLW streams that have potential to generate harmful gases, vapors, or liquids. In addition, WPM will identify waste streams that are candidates for treatment to reduce volume or provide a structurally more stable waste form. Physical treatment of low/high grade residues is typically to remove free liquids. The compliance method for meeting this WAC is stated in Section III.C.2.2.d of this application.

2.2.8 Etiologic Agents

Low/high grades residues to be shipped to the NTS shall not contain pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR 173.134. (NVO-325 (Rev.1), 5.5.1.1(G)).

Compliance Method The only significant source of potential etiologic agents on site is from medical services. Such materials may include band aids, tongue blades, syringes, cotton balls or other materials stained with blood or other body fluids, and outdated pharmaceuticals. These materials are managed according to Ohio Infectious Waste Law/Regulation (ORC 3734.021 and OAC 3745-27 through 25) which includes segregated packaging at the point of generation. Materials are placed in a red bag in a box premarked with the international biohazard label in accordance with procedure MS-C-011, "Medical Infectious Waste Management." These boxes are then transported by a registered transporter to a licensed treatment facility. These administrative controls prevent etiologic agents from entering the low/high grade residues waste stream. Reference FEMP Waste Characterization Plan, PL-3052(M-128) - Infectious Waste Section for additional evaluation criteria.

Infectious waste is addressed on completing the MEF (EW-0001). In addition, the Prohibited Materials list, which is posted at time of packaging (PT-0005, -0006, and -0007), includes "medical waste" under "Etiological Agents." This ensures no etiological waste, that may be present in the radiological controlled areas, are packaged for shipment to the NTS.

2.2.9 Chelating Agents

If a waste is determined to contain chelating agents above the one percent by weight limit, the waste shall not be approved for disposal at the NTS. (NVO-325 (Rev.1), 5.5.1.1(H)).

Compliance Method Chemicals from the on-site laboratory are materials that may potentially be classified as chelating agents. WCS has generated a list of potential chelating or complexing agents through an on-line database search and will consult this list to evaluate potential chelating or complexing agents.

Containers not meeting the criteria for shipment will be segregated from other waste being shipped for disposal at the NTS. Chelating agent content will be determined through the use of the NTS WAC checklist provided in the Waste Characterization Plan, PL-3052(M-128). This checklist is used in the process of completing the MEF (following EW-0001, Initiating Waste Characterization

Activities Using the Material Evaluation Form) and will identify waste that contain chelating agents above one percent by weight.

2.2.10 Polychlorinated Biphenyls

PCB contaminated waste shall not be shipped for disposal at NTS in the low/high grade residues waste stream unless the PCB concentration meets the municipal solid waste disposal limits. See Title 40 CFR 761.60 for PCB disposal requirements. (NVO-325 (Rev.1), 5.5.1.1(I)).

Compliance Method The FEMP samples wastes for PCB contamination when the waste matrix (e.g., oily material) or review of previous operations, manufacturers manuals, and previous sampling and analyses provides a reason to suspect PCB contamination. This determination is performed during the hazardous waste determination (EW-0001). Reference FEMP Waste Characterization Plan, PL-3052(M-128) - TSCA PCB Section 8 for evaluation criteria.

2.2.11 Explosives and Pyrophorics

Low/high grade residues shall not contain potentially explosive or pyrophoric material in a form that may spontaneously combust if the container is breached. (NVO-325 (Rev.1), 5.5.1.1(J)).

Compliance Method This WAC is evaluated during the hazardous waste characterization. This evaluation is performed in accordance with EW-0001, "Initiating Waste Characterization Activities Using the Material Evaluation Form (MEF)" and FEMP Waste Characterization Plan, PL-3052(M-128). Any waste that potentially fails this WAC, such as uranium turnings, filings, and etc., shall be identified by WCS and the material will not be shipped to the NTS for disposal unless sampling and analysis verifies that this WAC has been met.

2.3 Waste Stream General Package Criteria

2.3.1 Design

Waste packaging criteria for low/high grade residue containers with less than 50 percent U_{TOT} or less than 1 percent ^{235}U shipped to the NTS for disposal will meet DOT Regulations, 49 CFR 173, Subpart I. High grade residues containing greater than 50 percent U_{TOT} and greater than 1 percent ^{235}U will be packaged according to 49 CFR 173.451 through 173.459. Standard operating procedures listed in Section III of the Waste Certification Plan, concerning off-site shipments, will be used to assure that all shipments meet DOT requirements and NTS site-specific requirements.

2.3.2 Nuclear Safety

The quantity of radioactive materials in low/high grade residue shipped to the NTS will be limited so that an infinite array of packages will remain subcritical. This quantity will be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, or by taking into account the actual materials in the waste. Material containing fissile isotopes shipped under this waste stream will be packaged to meet fissile packaging exceptions delineated in 49 CFR, Parts 173.453. Low/high grade residue are typically exempted from fissile packaging requirements as

documented in the FEMP Radiological Characterization Manual (RM-0041) by one of the following criteria:

- A package containing uranium enriched in ^{235}U to a maximum of one percent by weight, and with a total plutonium and ^{233}U content of up to one percent of the mass of ^{235}U , if the fissile radionuclides are homogeneously distributed throughout the package contents, and must not form a lattice arrangement within the package.
- Not more than 5 grams of fissile radionuclides in any 10-liter volume. The material will be packaged so as to maintain this limit of fissile radionuclide concentration during normal transportation.

2.3.3 Nuclear Heating

In compliance with 49 CFR 173.442, Thermal Limitations, a Health Physics evaluation of waste packages of material to be shipped to the NTS from the FEMP will show no evidence of a heating effect above NVO-325 (Rev.1) limits from radiological decay. Calculations from these waste streams at the FEMP were made following SD-ES&H-BAS-3019, "Technical Basis for Calculating Nuclear Decay Heat Production from Packaged Radioactive Waste." The purpose of the technical basis is to demonstrate the process of determining nuclear heating in watts/kg. These calculations are based on the total alpha, beta, and gamma energy from each significant isotope in the waste and its associated daughters during normal radioactive decay.

2.3.4 Radiation Levels

In compliance with 49 CFR 173.441, Radiation Levels, the radiation exposure rate at the surface and at 1 meter from each package will be measured following procedure RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving" and recorded in the shipment data package. Low/high grade residue packages that exceed 200 millirem/hr on contact will not be shipped to NTS.

2.3.5 External Contamination

In compliance with 49 CFR 173.443, the surface contamination of each container will be measured using instruments calibrated by Environmental Safety & Health (ES&H), Dosimetry, Instrumentation Section and recorded in the data package. LLRW packages are shipped from the FEMP after meeting the FEMP's limits for radioactive material shipments stated in RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving." The FEMP's limits are more restrictive than 49 CFR 173.443. If decontamination below the FEMP limits for removable radioactivity are not met with reasonable efforts, the FEMP limits may be exceeded with the concurrence of Radiological Compliance. However, in no case will external contamination levels exceed the limits in 49 CFR 173.443.

2.3.6 Activity Limits

In compliance with Titles 49 CFR 173.421, "Limited Quantities of Radioactive Materials," and 49 CFR 173.425, "Transport Requirements for Low-Specific Activity Radioactive Materials", the activity limits will be met. Strong, tight containers used for shipping Limited Quantities (LQ) and Low-Specific Activity (LSA) LLW will be constructed and loaded so they will not leak during normal transportation and handling conditions.

The containers and trucks are surveyed (RC-RDA-006, "Radioactive Material Shipping & Receiving") to verify compliance before shipping. In addition, the maximum Specific Activity is calculated to ensure the activity limits are not exceeded.

2.3.7 Multiple Hazards -

Not applicable, the FEMP does not ship low/high grade residue wastes with multiple hazards to the NTS.

2.4 Waste Stream Specific Package Criteria

2.4.1 Closure

All low/high grade residue package closures will be sturdy enough to assure the closures will not be breached under normal handling conditions and will not serve as weak points for package failure.

2.4.2 Strength

Low/high grade residue will be packaged in containers capable of supporting a uniformly distributed load of 4,000 lbs/ft², except for waste packaged in DOE/NV approved containers (drums and ISO containers).

2.4.3 Handling

All low/high grade residue containers will have permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar handling equipment. Lifting rings and other auxiliary lifting devices will be recessed, offset, or hinged in a manner that does not inhibit stacking the packages. The lifting devices will meet a 5:1 safety factor based upon the ultimate strength of the material. All rigging devices that are not permanently attached to the waste package will have a current load test based on 125 percent of the safe working load.

2.4.4 Size

FEMP low/high grade residue will be packaged in 55-gallon drums, 85-gallon drums or boxes from Table I.

2.4.5 Weight

Compliance with the weight limits specified in NVO-325 is controlled by procedures for packaging waste in containers listed in Section VI of this application. The FEMP maintains a net weight of 882 pounds per drum. The weight limits for other containers are provided in Table I. Containers of low/high grade residues exceeding the limits specified in Table I will be handled as specified in Section 2.8.1 below.

2.4.6 Loading

Low/high grade residue will be packaged to ensure that the interior volume is as efficiently and compactly loaded as practical.

2.4.7 Nonstandard Type A Packaging

The FEMP is currently using a strong, tight container that has been tested to Type 7A Container specifications. Used for this purpose, the container does not require a DOT Type A Certification. If a Type A Container is required to ship low/high grade residues, only containers with a DOT Type A Certification will be used.

2.4.8 Package Protection

Every FEMP low/high grade residue package will be prepared for shipment so as to minimize damage during transit. The pre-shipment storage environment will be controlled to avoid adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. FEMP will take all responsibility for pre-shipment storage and take all reasonable precautions to preclude the accumulation of moisture on or in packages prior to their arrival to the NTS. Tamper indicating devices are used to maintain control of the container once certification actions are completed.

The FEMP will package all low/high grade residue for shipment to NTS in containers meeting DOT requirements (containers meeting HM 181 specifications). All containers will be shipped to meet DOT requirements for interstate travel and will meet the requirements of 49 CFR 173.411, 173.421, and 173.425.

2.4.9 Marking and Labeling

Low/high grade residue shipped to the NTS will be marked and labeled as required in Title 49 CFR 172, Subparts D and E [with exceptions noted in Title 173.425 (b) and (c)]. Also, each waste container will be marked with a unique six character container identification number and eight character shipment number per NVO-325 (Rev.1), 5.5.1.3(I,3) so that the container can be identified from another container within the shipment or from another set of containers. The approved 13 digit waste stream number (ONLO000000006) will also be placed onto the waste container. Marking and labeling of the low/high grade residue packages will be for radioactive material. The weight of the package will be marked in pounds and kilograms. Signed NV-211 labels will be affixed to containers certified for shipment to the NTS.

2.4.10 Barcoding

Barcode labels will meet NVO-325 (Rev.1), requirements and must be approved by DOE/NV prior to use. A minimum of two barcode labels will be placed near the top and on opposite sides of each low/high grade residue waste package. A third label may be applied to one end of bulk containers, or on top of 4'x 4'x 7' metal boxes. Barcode Labels on drums will be placed on the lid and one side near the top of the drum.

2.4.11 On-site Transfer

Only packaged low/high grade residue is shipped from the FEMP for disposal at the NTS. The FEMP will not provide any material which will require on-site transfer of unpackaged bulk materials by the NTS.

2.5 Additional Criteria for Mixed Waste

None of the waste streams listed in this application are mixed waste. The FEMP will not be disposing of mixed waste at the NTS.

2.6 Additional Criteria for Transuranic/Transuranic Mixed Waste

None of the waste streams listed in this application contain Transuranic or Transuranic Mixed waste. The FEMP will not be disposing of Transuranic or Transuranic Mixed waste at the NTS.

2.7 Additional Criteria for Bulk Waste

The FEMP is not currently and does not intend to ship mixed waste to the NTS for disposal. By default, the FEMP will not be shipping mixed waste as bulk waste or mixed waste for bulk disposal.

2.8 Additional Criteria for Case-by-Case Waste

2.8.1 Weight

The FEMP is currently shipping and intends to continue to ship waste containers within the limits specified in Table I. Containers (codes 109, 121, and 133) routinely weigh greater than 9,000 pounds and require either a large fork truck or crane for removal from the transport vehicle. The FEMP ships these containers on flat bed trailers which require no top or side wall removal. The FEMP will obtain approval from NTS prior to shipment of any other container listed in Table I exceeding the 9,000 pound limit. All containers weighing more than 9,000 pounds will be shipped on flat bed trailers or vans with removable sides or tops.

2.8.2 Activity Limits

All containers shipped from the FEMP for disposal at the NTS are within the activity limits specified in NVO-325 (Rev.1), Section 5.5.1.2.F.

2.8.3 Radioactively Contaminated Asbestos

Friable asbestos will not be shipped to the NTS before securing DOE/NV approval. All radioactively contaminated regulated asbestos will be in waste stream ONLO000000010, "Radioactively Contaminated Regulated Asbestos Containing Material."

2.8.4 DOE Comparable Greater-Than-Class-C As Defined in 10 CFR 61.55

This requirement is not applicable to the FEMP waste streams since no greater- than-Class-C waste is shipped from the FEMP for disposal at NTS.

2.8.5 Classified Waste Streams

This requirement is not applicable, the FEMP will not ship classified waste for disposal at the NTS under this waste stream.

2.8.6 Radioactive Animal Carcasses

This requirement is not applicable to the FEMP waste streams. No radioactive animal carcasses are included in the low/high grade residues waste stream. This requirement is intended to address waste streams that include radioactively contaminated laboratory test animal carcasses. The animals (birds and small mammals) from the contaminated area that may intermittently appear in FEMP waste streams are not subject to this requirement.

2.8.7 Other Waste Forms

The FEMP will secure DOE/NV approval for any waste forms that do not meet the criteria included in this waste stream Information section before shipping to the NTS.

2.9 Packaging and Shipping Information

Low/High Grade Uranium Residues will be packaged and shipped according to the DOT requirements for Radioactive material, LSA, n.o.s.

2.10 Waste Security Information

This section is not applicable. No classified waste is shipped for disposal at the NTS in this waste stream.

Nevada Test Site Waste Profile, Revision 0

A. Generator Information

1. WCO Michael F. Ramirez Phone (513) 648-5668 FAX (513) 648-5701
 2. Technical Contact Dayne A. Thomas Phone (513) 648-5672 FAX (513) 648-5649
 3. DOE Contact David M. Rast Phone (513) 648-3138 FAX (513) 648-3077
 4. Facility Name Fernald Environmental Management Project
 Address P.O. Box 398704
 City Cincinnati State Ohio Zip 45239-8704
 5. EPA Identification Number OH6890008976

B. General Waste Stream Information

1. Waste Stream Identification Number ONLO000000010
 Profile Revision Number 99 Profile Revision Date 9/04/97
 2. Title of Waste Stream Radioactively Contaminated Regulated Asbestos Containing Material
 3. Waste Category ☒ Low-Level ☐ Mixed Low-Level (Generated within Nevada only)
 4. Generating Process Description
See Waste Stream Characterization Data Sheets Attached

 Process Description Continuation Page Attached ☒ Yes ☐ No
 Flow Diagram Attached ☐ Yes ☒ No
 5. Estimated Rate of Generation ☒ One Time Only 700 m³
☐ Ongoing _____ m³/yr
 6. Reason for Submittal (specify one)
☐ New Waste Stream
☐ Modification to Waste Stream Date Change Effective _____
☐ Terminate Waste Stream
☒ Profile for currently Approved Waste Stream
 7. ☒ Yes ☐ No Does this waste stream require a WAC deviation? Attach information.

2.1.1 WASTE STREAM CHARACTERIZATION DATA SHEET2.1.1.1 Waste Stream No.: 0 N L 0 0 0 0 0 0 0 1 0

1. Waste Description:

a. Physical Characteristics:

Solid demolition materials from construction, maintenance, and/or removal action activities which generate regulated asbestos, soil, metal, wood, paper, plastic, and asphalt containing regulated asbestos. (Absorbent is added to contain free liquid at the time of packaging.)

b. Special Handling/Disposal Requirements:

None. The average radiation levels on contact is .50 mrem/hr. with a range of <.50 mrem/hr. to 1.5 mrem/hr.

2. Basis for Characterization:

a. Process Knowledge:___ b. Analytical Knowledge:___ c. Both: ✓

If b or c, provide Standard Data Reporting Forms as necessary.

NOTE: Waste characterization of materials included in this waste stream is completed using a combination of process knowledge and sampling and analysis. Process knowledge is used when the material meets one or more of the criteria of NVO-325 (Rev.1), Section 4.1.1.A, B, and C. (Materials characterized by process knowledge includes metal, wood and other construction/demolition debris, and equipment.) Sampling and analysis of the coatings on ACMs may be required to support process knowledge.

3. Radioactive Characteristics:

a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: Nob. WMIS Nuclide Category (circle): 1 2 3 4 5 NA 7 8

(Choose the highest predominate nuclide. The number 6 is not an option.)

c. Radioactive Constituents:

Specific Activity Range of Waste Stream

<u>Nuclide</u>	<u>Chemical Forms</u>	<u>Low</u>	<u>Mean</u>	<u>High</u>	<u>Units</u>
(1) U-238	*	3.4E-09	1.0E-07	1.8E-04	Ci/kg
(2) U-236	*	0.0	6.4E-09	1.0E-05	Ci/kg
(3) U-235	*	1.0E-09	4.2E-09	2.3E-05	Ci/kg
(4) U-234	*	2.0E-09	9.1E-08	2.1E-04	Ci/kg
(5) Tc-99	oxides	0.0	6.7E-09	1.3E-05	Ci/kg

* Uranium oxides and salts (typically UO_3 , U_3O_8 , and UF_4)

4. Hazardous Components (for MW): **NOT APPLICABLE**

a. Basis for Identifying as MW (circle):

(1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

<u>EPA Hazardous Waste Number</u>	<u>Chemical Name</u>	<u>Treatment Performed</u>	<u>Regulatory Threshold/Treatment Standard</u>
(1)			
(2)			
(3)			
(4)			

2.2 Waste Stream Specific Criteria

2.2.1 Low Level Waste

Only contaminated RACMs defined as LLW per DOE Orders 5820.2A, 5400.1, and 5480.11 guidelines shall be shipped to the NTS. (NVO-325 (Rev.1), 5.5.1).

Compliance Method In general, wastes that originate from Controlled Areas at the FEMP are considered radioactive waste unless demonstrated otherwise through analysis or administrative controls. Further guidance on radioactive waste characterization is provided in the DOE Performance Objective (Draft). In accordance with the "Waste Minimization and Pollution Prevention Awareness Plan," the FEMP attempts to minimize waste generation whenever possible.

2.2.2 Transuranics

Contaminated RACMs shall have a TRU concentration less than 100 nCi/g (i.e., shall not be regulated as TRU waste). (NVO-325 (Rev.1), 5.5.1.1(A)).

Compliance Method The Radioactively Contaminated Regulated Asbestos Containing Materials are typical of that generated by Operable Unit 3 (OU3) which sampled the waste for radiological characterization. The isotopic content is reported in the OU3 Remediation Investigation / Feasibility Study (RI/FS) report. No TRU isotope was identified in the OU3 RI/FS with a concentration greater than 1.3 nCi/g and the sum of the highest detected concentrations for Np-237 + Pu-238 + Pu-239/240 + Am-241 = 1.54 nCi/g.

2.2.3 Hazardous Waste

All contaminated RACMs shall be evaluated for hazardous waste by analytical characterization or by identifying material(s) listed as hazardous in Title 40 CFR 261, "Identification and Listing of Hazardous Waste," or in the regulations of the state where the waste is generated. (NVO-325 (Rev.1), 5.5.1.1(B)).

Compliance Method All RACM waste generated from construction, maintenance, and removal actions are evaluated by WCS to determine if these wastes are regulated as hazardous waste as follows:

- (1) During the planning phase of the project, the project engineer identifies all potential RACM waste that may be generated (EW-0001).
- (2) A project walkdown is then conducted to collect information on the waste to be generated and the generation process (e.g., excavate or dismantle).
- (3) Using process knowledge, WCS classifies the waste.
- (4) The characterization is documented using either the General MEF or by issuing a RCRA Determination/Radiological Characterization (RD/RC) letter.

All ACM waste generated from construction, maintenance, and removal actions are handled as specified in NVO-325 (Rev.1), 5.5.5.3. All regulated asbestos that is friable or otherwise capable of giving off friable asbestos dust is wetted with a water and surfactant mix and stored in two plastic bags whose individual thickness equals at least 6 mil. The plastic bags are overpacked in a leak-resistant wood or metal container that meets shipping requirements for the radioactive content of the package involved. Sharp edges and corners within the package are padded or otherwise protected to prevent damage to the plastic inner wrap during handling, shipping, and disposal. Because the asbestos must be wetted during abatement activities, an absorbent is added to the overpack container to ensure compliance with the free liquid requirement (see NVO-325 (Rev.1), Section 5.5.1.1.C).

All LLW containing regulated asbestos is packaged, marked, and labeled in accordance with the requirements of 40 CFR 61.150 as required in the packaging procedure PT-0007.

2.2.4 Free Liquids

Contaminated RACMs disposed at NTS waste management sites shall contain as little free liquids as is reasonably achievable. In no case shall the liquid equal or exceed 0.5 percent by volume of the external waste container and shall meet the NVO-325 (Rev.1), 5.5.1.1(C) criteria.

Compliance Method During the removal of ACM, wetting of the material is often preformed as prescribed by 40 CFR 61 to reduce personal and environmental exposure. This wetting and subsequent waste packaging is performed in such a manner as to provide protection without compromising intent of the NVO-325 (Rev.1) requirements to have less than 0.5 percent by volume of free liquid. The packaging process for wet asbestos is addressed in Exemption B, Section V. of this application.

Free liquids in contaminated RACMs are evaluated based on process knowledge or testing to determine if the waste stream meets this criteria. Determinations based on process knowledge generally include a visual inspection. Working fluids from equipment/piping will be determined to be eliminated when the chamber containing the liquid has been drained completely and no dripping is observed. Chambers will be plugged or sealed and the equipment tagged as being drained. Free liquid determinations are generally completed as part of the RCRA waste characterization process. (Reference FEMP Waste Characterization Plan, PL-3052(M-128) - RCRA Section.) Absorbent is added into the overpack container at the time of packaging to fix the water used to control dust during asbestos abatement.

Real-Time Radiography (RTR) may be used to verify the absence of free liquids in drum and White Metal Box (WMB) final packages of this waste stream. Representative sampling is preformed to ensure compliance with the free-liquid criteria. In the event that free liquid is detected, the container is segregated and not shipped; DR and QC reports are generated; the container is opened, drained, and repacked; and more or all the containers generated by that work activity are evaluated by RTR.

The RACM wastes are protected from the elements during storage to minimize any contact with water in accordance with PT-0003, "Control and Movement of Containers at the FEMP."

2.2.5 Particulates

Wastes containing greater than 1 weight percent fine particulate materials less-than-ten-micrometer-diameter or 15 weight percent less-than-200 micrometer diameter particles shall be immobilized or packaged in accordance with NVO-325 (Rev.1), 5.5.1.1(D).

Compliance Method Some contaminated RACM streams will categorically fail the particulates WAC while others may require testing to complete a rigorous evaluation. Friable ACMs have been defined to have greater than one percent by weight of less-than-ten-micron-diameter particles, depending on the moisture content. Testing is required to clearly determine if the asbestos containing material meets the WAC. This testing will be conducted using polarized light microscopy. Should the waste fail the criteria for particulates, immobilization is achieved by packaging. RACM will be double wrapped in plastic with a combined thickness equaling at least six mil. Wrapped RACM is packaged using steel drums, wooded crates, or steel boxes, in accordance with NVO-325 (Rev.1), Section 5.5.5.3.

2.2.6 Gases

Contaminated asbestos containing material streams shall be evaluated to determine if they contain any items that potentially produces pressure in the package greater than 1.5 atmospheres at 20° Celsius. (NVO-325 (Rev.1), 5.5.1.1(E))

Compliance Method Contaminated RACMs are evaluated for the potential to produce pressure in excess of 1.5 atmospheres at 20° C during the hazardous waste determination in the process of completing the MEF (EW-0001). The primary source of gases in this waste stream, compressed gas cylinders, shall have their valves removed to demonstrate that they are at atmospheric pressure. Aerosol cans shall be punctured and void of all free liquids to demonstrate that they meet the WAC. Representative sampling of drum and WMB final packages are evaluated by RTR to verify that compressed cylinders and aerosol cans have been altered.

2.2.7 Stabilization

Where practical, contaminated RACMs shall be treated to reduce volume and provide a more structurally and chemically stable waste form. (NVO-325 (Rev.1), 5.5.1.1(F))

Compliance Method The FEMP will identify wastes that are candidates for treatments to reduce volume and provide a structurally stable waste form. No treatment of this waste will be required to stabilize harmful gases or vapors. WCS will identify all LLW streams that have potential to generate harmful gases, vapors, or liquids. Waste that fail this WAC will not be shipped to the NTS.

2.2.8 Etiologic Agents

All contaminated RACMs to be shipped to the NTS shall not contain pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR 173.134. (NVO-325 (Rev.1), 5.5.1.1(G)).

Compliance Method The only significant source of potential etiologic agents on site is from medical services. Such materials may include band aids, tongue blades, syringes, cotton balls, outdated pharmaceuticals, or other materials stained with blood or other body fluids. These materials are managed according to Ohio Infectious Waste Law/Regulation (ORC 3734.021 and OAC 3745-27 through 25) which includes segregated packaging at the point of generation. Materials are placed in a red bag in a box premarked with the international biohazard label in accordance with procedure MS-C-011, "Medical Infectious Waste Management." These boxes are then transported by a registered transporter to a licensed treatment facility. These administrative controls prevent etiologic agents from entering the contaminated ACM waste stream. Reference FEMP Waste Characterization Plan, PL-3052(M-128) - Infectious Waste Section for additional evaluation criteria.

Infectious waste is addressed on completing the MEF (EW-0001). In addition, the Prohibited Materials list, which is posted at time of packaging (PT-0005, -0006, and -0007), includes "medical waste" under "Etiological Agents." This ensures no etiological waste, that may be present in the radiological controlled areas, are packaged for shipment to the NTS.

2.2.9 Chelating Agents

If a waste is determined to contain chelating agents above the one percent by weight limit, the waste shall not be approved for disposal at the NTS. (NVO-325 (Rev.1), 5.5.1.1(H)).

Compliance Method Radioactively contaminated regulated asbestos containing waste will always meet this NVO-325 (Rev.1), WAC based on the waste matrix and compliance with the checklist requirements. None of materials which comprise the basic waste matrix (e.g., pipe insulation; friable transite; rocks and gravel containing RACM; paper, plastic, PPE, respirator cartridges, etc. commingled with RACM; equipment, metal, wood, pipes, ductwork, and other building materials with RACM insulation; and glove box frames) are considered chelating agents. In addition, the checklist (PT-0011) prohibits free liquids and requires that suspect residues be removed from the scrap waste before it may be packaged for disposal at the NTS.

2.2.10 Polychlorinated Biphenyls

PCB contaminated waste shall not be shipped for disposal at NTS in the contaminated asbestos containing material stream unless the PCB concentration meets the municipal solid waste disposal limits. See Title 40 CFR 761.60 for PCB disposal requirements. (NVO-325 (Rev.1), 5.5.1.1(I)).

Compliance Method The FEMP samples wastes for PCB contamination when a reason to suspect PCB contamination is provided by:

- a likely waste matrix (e.g., oily material),
- a review of previous operations,
- a review of manufacturers manuals,

- previous sampling and analyses data.

This determination is performed during the hazardous waste determination (EW-0001). Reference FEMP Waste Characterization Plan, PL-3052(M-128) - TSCA PCB Section 8 for evaluation criteria.

2.2.11 Explosives and Pyrophorics

Contaminated regulated asbestos containing material shall not contain potentially explosive or pyrophoric material in a form that may spontaneously combust if the container is breached. (NVO-325 (Rev.1), 5.5.1.1(J)).

Compliance Method This WAC is evaluated during the hazardous waste characterization and is also generally addressed in the health and safety plan for a project if there is any concern. This evaluation is performed in accordance with the FEMP Waste Characterization Plan, PL-3052(M-128). Any waste that potentially fails this WAC will be identified by WCS and the material will not be shipped to the NTS for disposal.

2.3 Waste Stream General Packaging Criteria

2.3.1 Design

Waste packaging criteria for contaminated asbestos containing material shipped to the NTS for disposal will meet DOT Regulations, 49 CFR 173, Subpart I. Standard operating procedures listed in Section III of the Waste Certification Program Plan, concerning storage and off-site shipments, will be used to assure that all shipments meet DOT requirements and NTS site-specific requirements.

2.3.2 Nuclear Safety

The quantity of radioactive materials in contaminated RACMs shipped to the NTS will be limited so that an infinite array of packages will remain subcritical. This quantity will be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, and taking into account the actual materials in the waste. Material containing fissile isotopes shipped under this waste stream will be packaged to meet fissile packaging exceptions delineated in 49 CFR, part 173.453.

2.3.3 Nuclear Heating

In compliance with 49 CFR 173.442, Thermal Limitations, a Health Physics evaluation of waste packages of material to be shipped to the NTS from the FEMP will show no evidence of a heating effect above NVO-325 (Rev.1) limits from radiological decay. Calculations from these waste streams at the FEMP were made following SD-ES&H-BAS-3019, "Technical Basis for Calculating Nuclear Decay Heat Production from Packaged Radioactive Waste." The purpose of the technical basis is to demonstrate the process of determining nuclear heating in watts/kg. These calculations are based on the total alpha, beta, and gamma energy from each significant isotope in the waste and its associated daughters during normal radioactive decay.

2.3.4 Radiation Levels

In compliance with 49 CFR 173.441, Radiation Levels, the radiation exposure rate at the surface and at 1 meter from each package of contaminated asbestos containing material will be measured following procedure RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving" and recorded in the shipment data package. Contaminated asbestos containing material packages that exceed 200 mrem/hr on contact will not be shipped to NTS.

2.3.5 External Contamination

In compliance with 49 CFR 173.443, the surface contamination of each container will be measured using instruments calibrated by Environmental Safety & Health (ES&H), Dosimetry, Instrumentation Section and recorded in the data package. LLRW packages are shipped from the FEMP after meeting the FEMP's limits for radioactive material shipments stated in RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving." The FEMP's limits are more restrictive than 49 CFR 173.443. If decontamination below the FEMP limits for removable radioactivity are not met with reasonable efforts, the FEMP limits may be exceeded with the concurrence of Radiological Compliance. However, in no case will external contamination levels exceed the limits in 49 CFR 173.443.

2.3.6 Activity Limits

The activity limits of Titles 49 CFR 173.421, "Limited Quantities of Radioactive Materials," and 49 CFR 173.425, "Transport Requirements for Low-Specific Activity Radioactive Materials," will be met.

In compliance with Title 49 CFR 173.421 and 173.425, strong, tight containers used for shipping Limited Quantities (LQ) and Low-Specific Activity (LSA) LLW will not leak during normal transportation and handling conditions.

2.3.7 Multiple Hazards

All ACM waste generated from construction, maintenance, and removal actions are handled as specified in NVO-325 (Rev.1), 5.5.5.3. All regulated asbestos that is friable or otherwise capable of giving off friable asbestos dust is wetted with a water and surfactant mix and stored in two plastic bags whose combined thickness equals at least 6 mil. The plastic bags are overpacked in a leak-resistant wood or metal container that meets applicable shipping requirements for the radioactive content of the package involved. Sharp edges and corners within the package are padded or otherwise protected to prevent damage to the plastic inner wrap during abatement activities. An absorbent is added to ensure compliance with the free liquid requirement for LLW, see Section 5.5.1.1.C.

2.4 Waste Stream Specific Package Criteria

2.4.1 Closure

All contaminated RACM package closures will be sturdy enough to ensure the closures will not be breached under normal handling conditions and will not serve as weak points for package failure.

2.4.2 Strength

Contaminated RACM will be packaged in containers capable of supporting a uniformly distributed load of 4,000 lbs/ft², except for waste packaged in DOE/NV approved containers (drums and ISO containers).

2.4.3 Handling

All contaminated RACM containers will have permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar handling equipment. Lifting rings and other auxiliary lifting devices will be recessed, offset, or hinged in a manner that does not inhibit stacking the packages. Lifting devices will be designed to meet a 5:1 safety factor based upon the ultimate strength of the material. All rigging devices that are not permanently attached to the waste package will have a current load test based on 125 percent of the safe working load.

2.4.4 Size

In addition to standard 55 gallon and 85 gallon steel drums, the FEMP ships containers of contaminated RACM wastes identified in Table I.

2.4.5 Weight

Compliance with the weight limits specified in NVO-325 is controlled by procedures for packaging waste in containers listed in Section VI of this application. The FEMP maintains a net weight of 882 pounds per drum. The weight limits for other containers are provided in Table I. The FEMP routinely ships waste in containers exceeding 9,000 pounds. These containers are identified in Table I and approval of this application constitutes NTS approval to ship these containers. Containers of contaminated RACM exceeding the weight limits specified in Table I will be handled as specified in Section 2.8.1 below.

2.4.6 Loading

Contaminated RACM will be packaged to ensure that the interior volume is as efficiently and compactly loaded as practical.

2.4.7 Nonstandard Type A Packaging

The FEMP is currently using a strong, tight container that has been tested to Type 7A Container specifications. Used for this purpose, the container does not require a DOT Type A Certification. If a Type A Container is required to ship contaminated asbestos containing material, only containers with a DOT Type A Certification will be used.

2.4.8 Package Protection

Every FEMP contaminated RACM package will be prepared for shipment so as to minimize damage during transit. The pre-shipment storage environment will be controlled to avoid adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. FEMP will take all responsibility for pre-shipment storage and take all reasonable precautions to preclude the accumulation of moisture on or in packages prior to their arrival to the NTS. Tamper indicating devices are used to maintain control of the container contents once certification actions are completed.

- The FEMP will package all contaminated RACM for shipment to NTS in containers meeting DOT requirements (containers meeting HM 181 specifications). All containers will be shipped to meet DOT requirements for interstate travel and will meet the requirements of 49 CFR 173.411, 173.421, and 173.425. Sharp edges and corners of RACM within the package will be protected to prevent damage to the plastic liner during handling, shipping, and disposal.

2.4.9 Marking and Labeling

Contaminated RACM shipped to the NTS will be marked and labeled as required in Title 40 CFR 61.150, as well as 49 CFR 172, Subparts D and E [with exceptions noted in Title 173.425 (b) and (c)]. Also, each waste container will be marked with a unique six character container identification number and eight character shipment number per NVO-325 (Rev.1), 5.5.1.3(I,3) so that the container can be identified from another container within the shipment or from another set of containers. The approved 13 digit waste stream number (ONL0000000010) will also be placed onto the waste container. The contaminated RACM packages will be marked and labeled as radioactive material. The weight of the package will be marked in pounds and kilograms. Signed NV-211 labels will be attached to containers certified for shipment to the NTS.

2.4.10 Barcoding

Barcode labels will meet NVO-325 (Rev.1) requirements and must be approved by DOE/NV prior to use. A minimum of two barcode labels will be placed near the top and on opposite sides of each radioactive contaminated RACM waste package. A third label may be applied to one end of bulk containers, or on top of 4'x 4'x 7' metal boxes. Barcode Labels on drums will be placed on the lid and one side near the top of the drum.

2.4.11 On-site Transfer

Only packaged contaminated ACM is shipped from the FEMP for disposal at the NTS. The FEMP will not provide any material which will require on-site transfer of unpackaged bulk materials by the NTS.

2.5 **Additional Criteria for Mixed Waste**

None of the waste streams listed in this application are mixed waste. The FEMP will not be disposing of mixed waste at the NTS.

2.6 **Additional Criteria for Transuranic/Transuranic Mixed Waste**

None of the waste streams listed in this application contain Transuranic or Transuranic Mixed waste. The FEMP will not be disposing of Transuranic or Transuranic Mixed waste at the NTS.

2.7 **Additional Criteria for Bulk Waste**

The FEMP will ship containerized RACM bulk waste to the NTS for disposal in the form of scrap material (metal, wood, equipment) that is radioactively contaminated. This material is well below the 49 CFR 173.425(c) requirement of 0.001 millicurie per square centimeter when averaged over one square meter of the material. The type of container in which the FEMP ships bulk waste is identified in the sections relating to the NTS specific packaging criteria.

2.8 **Additional Criteria for Case-by-Case Waste**

2.8.1 Weight

The FEMP is currently shipping and intends to continue to ship waste containers that exceed the 9,000 pound weight limit. These containers (codes 109, 121, and 133) routinely weigh greater than 9,000 pounds and require either a large fork truck or crane for removal from the transport vehicle. The FEMP ships these containers on flat bed trailers which require no top or side wall removal. The FEMP will obtain approval from NTS prior to shipment of any other container listed in Table I exceeding the 9,000 pound limit. All containers weighing more than 9,000 pounds will be shipped on flat bed trailers or vans with removable sides or tops.

2.8.2 Activity Limits

All containers shipped from the FEMP for disposal at the NTS will be within the activity limits specified in NVO-325 (Rev.1), Section 5.5.1.2.F.

2.8.3 Radioactively Contaminated Asbestos

Radioactively contaminated asbestos containing materials with regulated asbestos levels exceeding 1.0 percent will only be shipped in waste stream ONLO00000010. Contaminated RACM will be treated and packaged as required in NVO-325 (Rev.1), Section 5.5.5.3.

2.8.4 DOE Comparable Greater-Than-Class-C As Defined in 10 CFR 61.55

This requirement is not applicable to the FEMP waste streams since no greater-than-Class-C waste is shipped from the FEMP for disposal at NTS.

2.8.5 Classified Waste Streams

This requirement is not applicable, the FEMP will not ship classified waste for disposal at the NTS under this waste stream.

2.8.6 Radioactive Animal Carcasses

This requirement is not applicable to the FEMP waste streams. No radioactive animal carcasses are included in the contaminated RACM stream. This requirement is intended to address waste streams that include radioactively contaminated laboratory test animal carcasses. The animals (birds and small mammals) from the contaminated area that may intermittently appear in FEMP waste streams are not subject to this requirement.

2.8.7 Other Waste Forms

The FEMP will secure DOE/NV approval for any waste forms that do not meet the criteria included in this waste stream Information section before shipping to the NTS.

2.9 Packaging and Shipping Information

Radioactively contaminated RACM will be packaged and shipped according to the DOT requirements for Radioactive material, LSA, n.o.s.

2.10 Waste Security Information

This section is not applicable. No classified waste is shipped for disposal at the NTS in this waste stream.

Nevada Test Site Waste Profile, Revision 0

A. Generator Information

1. WCO Michael F. Ramirez Phone (513) 648-5668 FAX (513) 648-5701
 2. Technical Contact Dayne A. Thomas Phone (513) 648-5672 FAX (513) 648-5649
 3. DOE Contact David M. Rast Phone (513) 648-3138 FAX (513) 648-3077
 4. Facility Name Fernald Environmental Management Project
 Address P.O. Box 398704
 City Cincinnati State Ohio Zip 45239-8704
 5. EPA Identification Number OH6890008976

B. General Waste Stream Information

1. Waste Stream Identification Number ONLO000000011
 Profile Revision Number 99 Profile Revision Date 9/04/97
2. Title of Waste Stream Thorium Residues and Wastes Not Amenable to Sampling
3. Waste Category ☒ Low-Level ☐ Mixed Low-Level (Generated within Nevada only)
4. Generating Process Description
See Waste Stream Characterization Data Sheets Attached
-
- Process Description Continuation Page Attached ☒ Yes ☐ No
 Flow Diagram Attached ☐ Yes ☒ No
5. Estimated Rate of Generation ☒ One Time Only 10 m³
☐ Ongoing _____ m³/yr
6. Reason for Submittal (specify one)
☐ New Waste Stream
☐ Modification to Waste Stream Date Change Effective _____
☐ Terminate Waste Stream
☒ Profile for currently Approved Waste Stream
7. ☒ Yes ☐ No Does this waste stream require a WAC deviation? Attach information.

G. WASTE STREAM IDENTIFICATION NUMBER ONL0000000011**Thorium Residues and Wastes Not Amenable to Sampling****1.0 Waste Type****Low Level Waste****2.0 Waste Description**

A waste stream is defined as a waste which is categorized by similar characterization process and/or point of generation. The criteria used for evaluating candidate LLW for shipment to the NTS, excerpted from the FEMP Waste Characterization Plan, PL-3052(M-128), are described on the following pages.

2.1 Thorium Wastes

This waste stream contains thorium which is characterized through process knowledge. Due to the heterogeneous composition and/or its physical nature, this material is not amenable to sampling. Process knowledge is used to characterize these waste materials. The waste is generated from well defined and documented processes.

1. The first source of waste is the thorium production process which occurred in the late 1960's and early 1970's. The production process was well understood and controlled, and the contents of these waste materials are well known. This process generated solid thorium metal and thorium oxide and hydroxide in pelletized and metal-clad forms. All of these are not amenable to sampling. These products are all thorium compounds containing the theoretical thorium content. No treatment of these materials other than size reduction or liquid removal will be performed prior to packaging. Process knowledge with historical sampling and analysis support is sufficient to characterize this waste stream.
2. The second source of waste for this waste stream is the remediation activities of the thorium production site. This remediation process generates plastic, wood pallets, anti-contamination clothing, crushed concrete, broken pieces of wood, and other construction media during the demolition phase of a construction, maintenance, or removal action project. No treatment is done prior to packaging. If waste does not meet the disposal criteria in its existing form, the waste is not packaged for disposal.

Scrap wastes contaminated with thorium and which are either heterogeneous or have matrices not amenable to sampling include:

- rocks, gravel, concrete
- metal
- plastic and glass
- wood
- trash (plastic, cardboard, paper, etc)

2.1.1 WASTE STREAM CHARACTERIZATION DATA SHEET

2.1.1.1 Waste Stream No.: 0 N L 0 0 0 0 0 0 0 1 1

1. Waste Description:

a. Physical Characteristics:

Thorium metal, thorium oxide and hydroxide generated during thorium oxide production. Small amounts of thorium oxalate and thorium tetrafluoride are also present. Dry solid demolition materials from removal action which generates gravel, concrete, metal, wood, paper, plastic, and glass.

b. Special Handling/Disposal Requirements:

This material has an average radioactive level on contact of 50 mrem/hr. with a range of < 25 mrem/hr. to 105 mrem/hr. Time, distance, and shielding techniques should be employed to reduce exposure.

2. Basis for Characterization:

a. Process Knowledge: ☒ b. Analytical Knowledge: ☐ c. Both: ☐

If b or c, provide Standard Data Reporting Forms as necessary.

3. Radioactive Characteristics:

a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: No

b. WMIS Nuclide Category (circle): 1 2 3 4 5 NA 7 8

(Choose the highest predominate nuclide. The number 6 is not an option.)

c. Radioactive Constituents:

Specific Activity Range of Waste Stream

<u>Nuclide</u>	<u>Chemical Forms</u>	<u>Low</u>	<u>Mean</u>	<u>High</u>	<u>Units</u>
(1) Th-232	*	1.1E-07	5.5E-05	1.1E-04	Ci/kg
(2) Th-228	*	1.1E-07	5.5E-05	1.1E-04	Ci/kg
(3) Th-230	*	0.0	1.1E-05	2.2E-05	Ci/kg
(4) U-238	**	3.3E-07	3.5E-06	6.7E-06	Ci/kg
(5) U-236	**	0.0	2.4E-07	4.8E-07	Ci/kg
(6) U-235	**	1.4E-08	1.6E-07	3.1E-07	Ci/kg
(7) U-234	**	3.6E-07	3.7E-06	7.1E-06	Ci/kg
(8) U-233	**	0.0	1.0E-06	1.0E-05	Ci/kg
(9) Tc-99	oxides	0.0	3.7E-05	7.5E-05	Ci/kg
(10) Ra-228	oxides	0.0	1.6E-07	1.1E-05	Ci/kg
(11) Ra-226	oxides	0.0	6.1E-07	1.5E-05	Ci/kg

* Thorium metal, oxide, hydroxide, oxalate, and tetrafluoride.

** Uranium oxides and salts (typically UO_3 , U_3O_8 , and UF_4)

4. Hazardous Components (for MW): **NOT APPLICABLE**

a. Basis for Identifying as MW (circle):

(1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

<u>EPA Hazardous Waste No.</u>	<u>Chemical Name</u>	<u>Treatment Performed</u>	<u>Regulatory Threshold/Treatment Standard</u>
(1)			

NOTE: Waste characterization of materials included in this waste stream is predominantly completed using process knowledge because the material meets the criteria of NVO-325 (Rev.1), Section 4.1.1.B. Materials characterized by process knowledge includes metal, wood, demolition debris, and process equipment. The FEMP has conducted visual inspection, and limited confirmatory analysis for waste amenable to sampling to support the process knowledge waste characterization for disposal at the NTS.

2.2 Waste Stream Specific Criteria

2.2.1 Low Level Waste

Only the thorium wastes defined as LLW per DOE Orders 5820.2A, 5400.1, and 5480.11 guidelines shall be shipped to the NTS. (NVO-325 (Rev.1), 5.5.1).

Compliance Method In general, waste that originate from Controlled Areas at the FEMP are considered radioactive waste unless demonstrated otherwise through analysis or administrative controls. Further guidance on radioactive waste characterization is provided in the DOE Performance Objective (Draft). In accordance with the "Waste Minimization and Pollution Prevention Awareness Plan," the FEMP attempts to minimize waste generation whenever possible.

2.2.2 Transuranics

Thorium wastes shall have a TRU concentration less than 100 nCi/g (i.e., shall not be regulated as TRU waste). (NVO-325 (Rev.1), 5.5.1.1(A)).

Compliance Method The Thorium Residues and Wastes Not Amenable to Sampling are generated by Operable Unit 3 (OU3) which sampled many items from this heterogeneous waste for radiological characterization. The highest TRU isotopic concentration for all samples of this waste stream was 0.37 nCi/g. Transuranics are not associated with the thorium process.

2.2.3 Hazardous Waste

All thorium wastes are evaluated for hazardous waste by analytical characterization, by identifying the material(s) listed as hazardous in Title 40 CFR 261, "Identification and Listing of Hazardous Waste," or in the regulations of the state where the waste is generated. (NVO-325 (Rev.1), 5.5.1.1(B)).

Compliance Method When thorium residue and thorium metal waste is considered for shipment to NTS, the following steps are taken to determine the presence of hazardous waste:

1. The generator contacts the responsible FERMCO WCS organization to obtain any hazardous waste evaluation data available for the thorium waste considered.
2. If no evaluation exists and characterization is required, the generator completes Section 1 of the MEF and submits the form to WCS for characterization (EW-0001).
3. WCS completes characterization by process knowledge. Process knowledge is used by obtaining available information about the waste generation process so that WCS can establish that the waste does not exhibit hazardous waste characteristics and does not contain any listed hazardous waste.

All thorium contaminated waste generated from demolition, maintenance, and removal actions are evaluated by WCS to determine if these wastes are regulated as hazardous waste as follows:

1. During the planning phase of the project, the project engineer identifies all potential thorium waste that may be generated (EW-0006).
2. A project walkdown is then conducted to collect information on the waste to be generated and the generation process (e.g., excavate or dismantle).
3. Using process knowledge, WCS classifies the waste.
4. The characterization is documented using either the General MEF or by issuing a RCRA Determination/Radiological Characterization (RD/RC) letter.

2.2.4 Free Liquids

Thorium wastes disposed at NTS waste management sites shall contain as little free liquids as is reasonably achievable, but in no case shall the liquid equal or exceed 0.5 percent by volume of the external waste container and shall meet the NVO-325 (Rev.1), 5.5.1.1(C) criteria.

Compliance Method Free liquids in thorium wastes are evaluated based on process knowledge or waste testing to determine if the waste stream meets this criteria. The thorium waste will be packaged according to PT-0006, PT-0007, and PT-0011 to assure that the level of free liquid will be less than 0.5 percent by volume of the external waste container. These packaged containers are stored protected from the elements in accordance with PT-0003, "Control and Movement of Containers at the FEMP" to minimize contact with water. The PFLT test may be performed to determine the presence of free liquids when process knowledge does not provide sufficient information to complete this determination. Reference FEMP Waste Characterization Plan, PL-3052(M-128).

2.2.5 Particulates

Wastes containing greater than 1 weight percent fine particulate materials less-than-ten-micrometer-diameter or 15 weight percent less-than-200 micrometer diameter particles shall be immobilized or packaged in accordance with NVO-325 (Rev.1), 5.5.1.1(D).

Compliance Method The thorium waste stream may categorically fail the particulates WAC. This material is packaged in steel boxes, following the task order and/or procedures PT-0005 and PT-0006, as specified by NVO-325 (Rev.1).

2.2.6 Gases

Gases shall be stabilized or absorbed so that pressure in the waste package does not exceed 1.5 atmospheres at 20° Celsius. Compressed gases as defined by Title 49 CFR 173.300, including unpunctured aerosol cans, shall not be shipped for disposal in the thorium waste stream. Aerosol cans shall have puncture disfigurements readily recognizable by real-time-radiography. Expanded gas cylinders shall have the valve mechanism removed. (NVO-325 (Rev.1), 5.5.1.1(E)).

Compliance Method The thorium waste packages were evaluated to determine if they contain any items that potentially fail this WAC during the hazardous waste determination in the process of completing the MEF (EW-0001).

2.2.7 Stabilization

When practical, Thorium waste shall be treated to reduce volume and provide a more structurally and chemically stable waste form. (NVO-325 (Rev.1), 5.5.1.1(F)).

Compliance Method Waste Characterization Services reviewed the thorium waste stream during the hazardous waste evaluation for potential harmful gas, vapor, or liquid generation. No treatment of the thorium waste stream other than size reduction or liquid removal will be required to meet the WAC for this waste stream.

2.2.8 Etiologic Agents

Thorium wastes to be shipped to the NTS shall not contain pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR 173.386. (NVO-325 (Rev.1), 5.5.1.1(G)).

Compliance Method The only significant source of potential etiologic agents on site is from medical services. Such materials may include band aids, tongue blades, syringes, cotton balls, outdated pharmaceuticals, or other materials stained with blood or other body fluids. These materials are managed according to Ohio Infectious Waste Law/Regulation (ORC 3734.021 and OAC 3745-27 through 25) which includes segregated packaging at the point of generation. Materials are placed in a red bag in a box premarked with the international biohazard label in accordance with procedure MS-C-011, "Medical Infectious Waste Management." These boxes are then transported by a registered transporter to a licensed treatment facility. These administrative controls prevent etiologic agents from entering the Thorium Residues and Wastes Not Amenable to Sampling waste stream. Reference FEMP Waste Characterization Plan, PL-3052(M-128) - Infectious Waste Section for additional evaluation criteria.

Infectious waste is addressed on completing the MEF (EW-0001). In addition, the Prohibited Materials list, which is posted at time of packaging (PT-0005, -0006, and -0007), includes "medical waste" under "Etiological Agents." This ensures no etiological waste, that may be present in the radiological controlled areas, are packaged for shipment to the NTS.

2.2.9 Chelating Agents

If a waste is determined to contain chelating agents above the one percent by weight limit, the waste shall not be approved for disposal at the NTS. (NVO-325 (Rev.1), 5.5.1.1(H)).

Compliance Method Thorium waste not amenable to sampling will always meet this NVO-325 (Rev.1), WAC based on the waste matrix and compliance with the checklist requirements. None of materials which comprise the basic waste matrix (e.g., crushed concrete, soil, broken pieces of wood and metal) are considered chelating agents. In addition, the checklist requires (PT-0011) that suspect residues be removed from the scrap waste before it may be packaged for disposal at the NTS.

2.2.10 Polychlorinated Biphenyls

PCB contaminated waste shall not be shipped for disposal at NTS in the thorium waste stream unless the PCB concentration meets the municipal solid waste disposal limits. See Title 40 CFR 761.60 for PCB disposal requirements. (NVO-325 (Rev.1), 5.5.1.1(I)).

Compliance Method The FEMP samples wastes for PCB contamination when a reason to suspect PCB contamination is provided by:

- a likely waste matrix (e.g., oily material),
- a review of previous operations,
- a review of manufacturers manuals, and
- previous sampling and analyses data.

This waste stream contains no oily material and no additional process knowledge exists to provide any reason to suspect PCB contamination. This determination is performed during the hazardous waste determination (EW-0001). Reference FEMP Waste Characterization Plan, PL-3052(M-128) - TSCA PCB Section 8 for evaluation criteria.

2.2.11 Explosives and Pyrophorics

The waste shall not contain potentially explosive or pyrophoric material in a form that may spontaneously combust if the container is breached. (NVO-325 (Rev.1), 5.5.1.1(J)).

Compliance Method This WAC is evaluated during the hazardous waste characterization. This evaluation is performed in accordance with EW-0001, Initiating Waste Characterization Activities Using the Material Evaluation Form (MEF) and FEMP Waste Characterization Plan, PL-3052(M-129). Any waste that potentially fails this WAC will be identified by WCS and the material will not be shipped to the NTS for disposal.1

2.3 Waste Stream General Package Criteria

2.3.1 Design

Waste packaging criteria for thorium waste shipped to the NTS for disposal shall meet DOT Regulations, 49 CFR 173, Subpart I. Standard operating procedures listed in Section III of the Waste Certification Program Plan, concerning storage and off-site shipments, will be used to assure that all shipments meet DOT requirements and NTS site-specific requirements.

2.3.2 Nuclear Safety

The quantity of radioactive materials in thorium waste shipped to the NTS will be limited so that an infinite array of packages will remain subcritical. This quantity will be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, and taking into account the actual materials in the waste and shall meet 49 CFR, Parts 173.453(c)(3) and 173.453(d). Thorium waste packages will not contain uranium enriched U-235 greater than one percent by weight. No packages contain U-233 in this waste stream.

2.3.3 Nuclear Heating

In compliance with 49 CFR 173.442, Thermal Limitations, a Health Physics evaluation of waste packages of material to be shipped to the NTS from the FEMP will show no evidence of a heating effect above NVO-325 (Rev.1) limits from radiological decay. Calculations from these waste streams at the FEMP were made following SD-ES&H-BAS-3019, "Technical Basis for Calculating Nuclear Decay Heat Production from Packaged Radioactive Waste." The purpose of the technical basis is to demonstrate the process of determining nuclear heating in watts/kg. These calculations are based on the total alpha, beta, and gamma energy from each significant isotope in the waste and its associated daughters during normal radioactive decay.

2.3.4 Radiation Levels

In compliance with 49 CFR 173.441, Radiation Levels, the radiation exposure rate at the surface and at 1 meter from each package of thorium waste shall be measured following procedure RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving" and recorded in the shipment data package. Thorium waste packages that exceed 200 millirem/hr on contact will not be shipped to NTS.

2.3.5 External Contamination

In compliance with 49 CFR 173.443, the surface contamination of each container will be measured using instruments calibrated by Environmental Safety & Health (ES&H), Dosimetry, Instrumentation Section and recorded in the data package. LLRW packages are shipped from the FEMP after meeting the FEMP's limits for radioactive material shipments stated in RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving." The FEMP's limits are more restrictive than 49 CFR 173.443. If decontamination below the FEMP limits for removable radioactivity are not met with reasonable efforts, the FEMP limits may be exceeded with the

concurrence of Radiological Compliance. However, in no case will external contamination levels exceed the limits in 49 CFR 173.443.

2.3.6 Activity Limits

The activity limits of Titles 49 CFR 173.421, "Limited Quantities of Radioactive Materials," and 49 CFR 173.425, "Transport Requirements for Low-Specific Activity Radioactive Materials" will be met.

In compliance with Title 49 CFR 173.421 and 173.425, strong, tight containers used for shipping Limited Quantities (LQ) and Low-Specific Activity (LSA) LLW will be constructed so they will not leak during normal transportation and handling conditions.

2.3.7 Multiple Hazards

Not applicable, the FEMP will not ship thorium wastes with multiple hazards to the NTS.

2.4 Waste Stream Specific Package Criteria

2.4.1 Closure

All thorium waste package closures will be sturdy enough to assure the closures will not be breached under normal handling conditions and will not serve as weak points for package failure.

2.4.2 Strength

Thorium waste will be packaged in containers capable of supporting a uniformly distributed load of 4,000 lbs/ft², except for waste packaged in DOE/NV approved containers (drums). The thorium waste packaged in containers that do not meet the strength requirement will be disposed in Area 5 and will require an exemption (see Section V.).

2.4.3 Handling

All Thorium waste containers will have permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar handling equipment. Lifting rings and other auxiliary lifting devices will be recessed, offset, or hinged in a manner that does not inhibit stacking the packages. The lifting devices will be designed to meet a 5:1 safety factor based upon the ultimate strength of the material. All rigging devices that are not permanently attached to the waste package will have a current load test based on 125 percent of the safe working load.

2.4.4 Size

FEMP thorium waste will be packaged in 55-gallon or 85-gallon drums or containers listed in Table I including one exempted box container, code 113.

2.4.5 Weight

Compliance with the weight limits specified in NVO-325 is controlled by procedures for packaging waste in containers listed in Section VI of this application. The FEMP maintains a net weight of 882 pounds per drum. The weight limits for other containers are provided in Table I. The FEMP routinely ships waste in containers exceeding 9,000 pounds. These containers are identified in Table I and approval of this application constitutes NTS approval to ship these containers. Containers of thorium waste exceeding the weight limits specified in Table I will be handled as specified in Section 2.8.1 below.

2.4.6 Loading

Thorium waste will be packaged to ensure that the interior volume is as efficiently and compactly loaded as practical.

2.4.7 Nonstandard Type A Packaging

The FEMP is currently using a strong, tight container that has been tested to Type 7A Container specifications. Used for this purpose, the container does not require a DOE Type A Certification. If a Type A Container is required to ship thorium waste, only containers with a DOE Type A Certification will be used.

2.4.8 Package Protection

Every FEMP thorium waste package will be prepared for shipment so as to minimize damage during transit. The pre-shipment storage environment will be controlled to avoid adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. FEMP will take all responsibility for pre-shipment storage and take all reasonable precautions to preclude the accumulation of moisture on or in packages prior to their arrival to the NTS. Tamper indicating devices are used to maintain control of the container contents once certification actions are completed.

The FEMP will package all thorium waste for shipment to NTS in containers meeting DOT requirements (containers meeting HM 181 specifications and other NTS approved containers listed in Table I, Section III. N., of this application). All containers shall be shipped to meet DOT requirements for interstate travel and will meet the requirements of 49 CFR 173.411, 173.421, and 173.425.

2.4.9 Marking and Labeling

Thorium waste shipped to the NTS will be marked and labeled as required in Title 49 CFR 172, Subparts D and E [with exceptions noted in Title 173.425 (b) and (c)]. Also, each waste container will be marked with a unique six character container identification number and eight character shipment number per NVO-325 (Rev.1), 5.5.1.3(I,3) so that the container can be identified from another container within the shipment or from another set of containers. The approved 13 digit waste stream number (ONLO000000011) will also be placed onto the waste container. The thorium waste packages will be marked and labeled as radioactive material. The weight of the

package will be marked in pounds and kilograms. Signed NV-211 labels will be attached to containers certified for shipment to the NTS.

2.4.10 Barcoding

Barcode labels will meet NVO-325 (Rev.1), requirements and must be approved by DOE/NV prior to use. A minimum of two barcode labels will be placed near the top and on opposite sides of each thorium waste package. A third label may be applied to one end of bulk containers, or on top of 4'x 4'x 7' metal boxes. Barcode Labels on drums will be placed on the lid and one side near the top of the drum.

2.4.11 On-site Transfer

Only packaged thorium waste is shipped from the FEMP for disposal at the NTS. The FEMP will not provide any material which will require on-site transfer of unpackaged bulk materials by the NTS.

2.5 Additional Criteria for Mixed Waste

None of the waste streams listed in this application are mixed waste. The FEMP will not be disposing of mixed waste at the NTS.

2.6 Additional Criteria for Transuranic/Transuranic Mixed Waste

None of the waste streams listed in this application contain Transuranic or Transuranic Mixed waste. The FEMP will not be disposing of Transuranic or Transuranic Mixed waste at the NTS.

2.7 Additional Criteria for Bulk Waste

The FEMP is not currently and does not intend to ship mixed waste to the NTS for disposal. By default, the FEMP will not be shipping mixed waste as bulk waste or mixed waste for bulk disposal.

The FEMP will ship bulk thorium waste to the NTS for disposal in the form of scrap material (e.g. metal, wood, equipment) that is radioactively contaminated. This material is well below the 49 CFR 173.425(c) requirement of 0.001 millicurie per square centimeter when averaged over one square meter of the material. The type of container in which the FEMP ships bulk waste is identified in the sections relating to the NTS specific packaging criteria.

2.8 Additional Criteria for Case-by-Case Waste

2.8.1 Weight

The FEMP is currently shipping and intends to continue to ship waste containers that exceed the 9,000 pound weight limit. These containers (codes 109, 121, and 133) routinely weigh greater than 9,000 pounds and require either a large fork truck or crane for removal from the transport vehicle. The FEMP ships these containers on flat bed trailers which require no top or side wall removal. The FEMP will obtain approval from NTS prior to shipment of any other container listed

in Table I exceeding the 9,000 pound limit. All containers weighing more than 9,000 pounds will be shipped on flat bed trailers or vans with removable sides or tops.

2.8.2 Activity Limits

All containers shipped from the FEMP for disposal at the NTS are within the activity limits specified in NVO-325 (Rev.1), Section 5.5.1.2.F.

2.8.3 Radioactively Contaminated Asbestos

Friable asbestos will not be shipped to the NTS before securing DOE/NV approval. All radioactively contaminated regulated asbestos will be in waste stream ONLO000000010, "Radioactively Contaminated Regulated Asbestos Containing Material."

2.8.4 DOE Comparable Greater-Than-Class-C As Defined in 10 CFR 61.55

This requirement is not applicable to the FEMP waste streams since no greater- than-Class-C waste is shipped from the FEMP for disposal at NTS.

2.8.5 Classified Waste Streams

This requirement is not applicable, the FEMP will not ship classified waste is shipped for disposal at the NTS under this waste stream.

2.8.6 Radioactive Animal Carcasses

This requirement is not applicable to the FEMP waste streams. No radioactive animal carcasses are included in the thorium waste stream. This requirement is intended to address waste streams that include radioactively contaminated laboratory test animal carcasses. The animals (birds and small mammals) from the contaminated area that may intermittently appear in FEMP waste streams are not subject to this requirement.

2.8.7 Other Waste Forms

The FEMP will secure DOE/NV approval for any waste forms that do not meet the criteria included in this waste stream Information section before shipping to the NTS.

2.9 Packaging and Shipping Information

Thorium waste will be packaged and shipped according to the DOT requirements for Radioactively material, LSA, n.o.s.

2.10 Waste Security Information

This section is not applicable. No classified waste will be shipped to the NTS in this waste stream.

Nevada Test Site Waste Profile, Revision 0

A. Generator Information

1. WCO Michael F. Ramirez Phone (513) 648-5668 FAX (513) 648-5701
 2. Technical Contact Dayne A. Thomas Phone (513) 648-5672 FAX (513) 648-5649
 3. DOE Contact David M. Rast Phone (513) 648-3138 FAX (513) 648-3077
 4. Facility Name Fernald Environmental Management Project
 Address P.O. Box 398704
 City Cincinnati State Ohio Zip 45239-8704
 5. EPA Identification Number OH6890008976

B. General Waste Stream Information

1. Waste Stream Identification Number ONLO000000012
 Profile Revision Number 99 Profile Revision Date 9/04/97
 2. Title of Waste Stream Thorium Residues
 3. Waste Category ☒ Low-Level ☐ Mixed Low-Level (Generated within Nevada only)
 4. Generating Process Description
See Waste Stream Characterization Data Sheets Attached
 Process Description Continuation Page Attached ☒ Yes ☐ No
 Flow Diagram Attached ☐ Yes ☒ No
 5. Estimated Rate of Generation ☒ One Time Only 1200 m³
☐ Ongoing _____ m³/yr
 6. Reason for Submittal (specify one)
☐ New Waste Stream
☐ Modification to Waste Stream Date Change Effective _____
☐ Terminate Waste Stream
☒ Profile for currently Approved Waste Stream
 7. ☒ Yes ☐ No Does this waste stream require a WAC deviation? Attach information.

H. WASTE STREAM IDENTIFICATION NUMBER ONLO000000012

Thorium Residues

1.0 Waste Type

Low Level Waste

2.0 Waste Description

A waste stream is defined as a waste which is categorized by similar characterization process and/or point of generation. The criteria used for evaluating candidate LLW for shipment to the NTS, excerpted from the FEMP Waste Characterization Plan, PL-3052(M-128), are described on the following pages.

2.1 Thorium Residue Wastes

This waste stream contains homogeneous thorium products which, due to ALARA concerns are characterized by process knowledge and historical confirmatory sampling and analysis. This waste stream includes approximately one-third of the thorium inventory stored at the FEMP.

The final form of this material is dry thorium residues packaged in drums overpacked in metal boxes. Thorium Residue Waste consists of:

- Thorium oxide
- Thorium hydroxide
- Thorium oxalate
- Thorium tetrafluoride

2.1.1 WASTE STREAM CHARACTERIZATION DATA SHEET

2.1.1.1 Waste Stream No.: 0 N L 0 0 0 0 0 0 0 1 2

1. Waste Description:

a. Physical Characteristics:

Dry thorium oxide and hydroxide generated during thorium oxide production. Small amounts of thorium oxalate and tetrafluoride are also present. No treatment of this material was performed prior to packaging.

b. Special Handling/Disposal Requirements:

This material has an average radioactive level on contact of 50 mrem/hr with a range of 25 mrem/hr to 105 mrem/hr. Time, distance, and shielding techniques should be employed to reduce exposure.

2. Basis for Characterization:

a. Process Knowledge: b. Analytical Knowledge: c. Both: ✓

If b or c, provide Standard Data Reporting Forms as necessary.

3. Radioactive Characteristics:

a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: No

b. WMIS Nuclide Category (circle): 1 (2) 3 4 5 NA 7 8
 (Choose the highest predominate nuclide. The number 6 is not an option.)

c. Radioactive Constituents:

Specific Activity Range of Waste Stream

<u>Nuclide</u>	<u>Chemical Forms</u>	<u>Low</u>	<u>Mean</u>	<u>High</u>	<u>Units</u>
(1) Th-232	•	1.1E-07	2.4E-05	1.1E-04	Ci/kg
(2) Th-228	•	1.1E-07	2.4E-05	1.1E-04	Ci/kg
(3) Th-230	•	1.1E-08	4.8E-06	1.1E-05	Ci/kg
(4) U-238	••	0.0	1.1E-07	5.0E-06	Ci/kg
(5) U-235	••	0.0	4.4E-09	2.0E-07	Ci/kg
(6) U-234	••	0.0	1.1E-07	5.0E-06	Ci/kg
(7) U-233	••	0.0	6.0E-09	2.0E-08	Ci/kg
(8) Ra-228	oxides	1.1E-07	2.4E-05	1.1E-04	Ci/kg

* Thorium metal, oxide, hydroxide, oxalate, and tetrafluoride.

4. Hazardous Components (for MW): **NOT APPLICABLE**

a. Basis for Identifying as MW (circle):

(1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

<u>EPA Hazardous Waste Number</u>	<u>Chemical Name</u>	<u>Treatment Performed</u>	<u>Regulatory Threshold/Treatment Standard</u>
(1)			
(2)			
(3)			
(4)			

NOTE: Waste characterization of materials included in this waste stream is completed using a combination of process knowledge and confirmatory sampling and analysis. Process knowledge is used when the material meets one or more of the criteria of NVO-325, (Rev.1), Section 4.1.1.A, B, C. (Examples of materials characterized by process knowledge includes residues from various thorium production processes.) Sampling and analysis is used to support process knowledge for materials not processed at FEMP and for residue materials.

2.2 Waste Stream Specific Criteria

2.2.1 Low Level Waste

Only the thorium wastes defined as LLW per DOE Orders 5820.2A, 5400.1, and 5480.11 guidelines shall be shipped to the NTS. (NVO-325 (Rev.1), 5.5.1).

Compliance Method In general, wastes that originate from Controlled Areas at the FEMP are considered radioactive waste unless demonstrated otherwise through analysis or administrative controls. Further guidance on radioactive waste characterization is provided in the DOE Performance Objective (Draft). In accordance with the "Waste Minimization and Pollution Prevention Awareness Plan," the FEMP attempts to minimize waste generation whenever possible.

2.2.2 Transuranics

Thorium wastes shall have a TRU concentration less than 100 nCi/g (i.e., shall not be regulated as TRU waste). (NVO-325 (Rev.1), 5.5.1.1(A)).

Compliance Method The Thorium Residues and Wastes Amenable to Sampling are included in Operable Unit 3 (OU3) which sampled many items from this heterogeneous waste for radiological characterization. The isotopic content is reported in the OU3 Remediation Investigation / Feasibility Study (RI/FS) report. The highest TRU isotopic concentration for all samples of this waste stream was 0.37 nCi/g. Transuranics are not associated with the thorium process.

The Thorium Residues are generated by Operable Unit 3 (OU3) which sampled the waste for radiological characterization. The isotopic content is reported in the OU3 Remediation Investigation / Feasibility Study (RI/FS) report. Transuranic content for all samples of this waste stream were less than 1 nCi/g.

2.2.3 Hazardous Waste

All thorium wastes shall be evaluated for hazardous waste by analytical characterization or by identifying the material(s) listed as hazardous in Title 40 CFR 261, "Identification and Listing of Hazardous Waste," or in the regulations of the state where the waste is generated. (NVO-325 (Rev.1), 5.5.1.1(B)).

Compliance Method When thorium residue waste is considered for shipment to NTS, the following steps are taken to determine the presence of hazardous waste:

- (1) The generator contacts the responsible FERMCO WCS organization for waste characterization to obtain any hazardous waste evaluation data available for the thorium waste considered.
- (2) If no evaluation exists and characterization is required, the generator completes Section 1 of the MEF and submits the form to WCS for characterization (EW-0001).
- (3) WCS completes characterization by process knowledge and sampling and analysis;
 - (a) Process knowledge is used by obtaining available information about the waste generation process so that WCS can establish that the waste does not exhibit hazardous waste characteristics and does not contain any listed hazardous waste.
 - (b) Sampling and analysis will be preformed according to a Sampling and Analysis Program which specifies the type and frequency of the sampling. The FEMP Sampling and Analysis Program approval process is described in a DOE/NV memorandum. Fernald Environment Management Project Low Level Waste Sampling and Analysis Program Review, received at the FEMP April 21, 1993. The quality of the process knowledge is a major factor in the selection of a SAP. WCS will:
 - Specify the parameters to be determined.

- Write a specific sampling plan,
- Specify the approved SOP to be used (e.g., for waste sampling, 20-C-806),

NOTE: All FEMP SOPs are issued as site controlled documents after the SOP has been through a review and approval process. The reviewers are selected by the SOP author based on the nature of the SOP.

- Submit samples to an analytical laboratory following chain-of-custody procedures and complete analysis per SW-846 Methodology,
- Complete a statistical analysis and quality assurance check on the analytical data, and
- Document the final characterization on the MEF.

4. A copy of the MEF is returned to the generator.

2.2.4 Free Liquids

Thorium wastes disposed at NTS waste management sites shall contain as little free liquids as is reasonably achievable, but in no case shall the liquid equal or exceed 0.5 percent by volume of the external waste container and shall meet the NVO-325 (Rev.1), 5.5.1.1(C) criteria.

Compliance Method Free liquids in thorium wastes are evaluated based on process knowledge or waste testing to determine if the waste stream meets this criteria. Determinations based on process knowledge generally include a visual inspection of at least 10 percent of a container population (e.g., during a sampling episode). The thorium waste will be packaged according to PT-0006, PT-0007, and PT-0011 to assure that the level of free liquid will be less than 0.5 percent by volume of the external waste container.

Free liquid determinations are generally completed as part of the RCRA waste characterization process. The PFLT test is performed to determine the presence of free liquids when process knowledge does not yield sufficient information to complete this determination. Reference FEMP Waste Characterization Plan, PL-3052(M-128).

The thorium wastes are protected from the elements during storage to minimize any contact with water in accordance with PT-0003, "Control and Movement of Containers at the FEMP."

2.2.5 Particulates

Wastes containing greater than 1 weight percent fine particulate materials less-than-ten-micrometer-diameter and or 15 weight percent less-than-200 micrometer diameter particles shall be immobilized or packaged in accordance with NVO-325 (Rev.1), 5.5.1.1(D).

Compliance Method This thorium waste stream may categorically fail the particulates WAC. This material is packaged in steel drums and overpacked into metal boxes, following the task order and/or procedures PT-0005 and PT-0006, meeting NVO-325 (Rev.1) requirements.

2.2.6 Gases

Gases shall be stabilized or absorbed so that pressure in the waste package does not exceed 1.5 atmospheres at 20° Celsius. Compressed gases as defined by Title 49 CFR 173.300, including unpunctured aerosol cans, shall not be shipped for disposal in the thorium waste stream. Aerosol cans shall have puncture disfigurements readily recognizable by real-time-radiography. Expanded gas cylinders shall have the valve mechanism removed. (NVO-325 (Rev.1), 5.5.1.1(E)).

Compliance Method The thorium waste packages were evaluated to determine if they contain any items that potentially fail this WAC during the hazardous waste determination in the process of completing the MEF (EW-0001).

2.2.7 Stabilization

When practical, Thorium waste shall be treated to reduce volume and provide a more structurally and chemically stable waste form. (NVO-325 (Rev.1), 5.5.1.1(F)).

Compliance Method Waste Characterization Services reviewed the thorium waste stream during the hazardous waste evaluation for potential harmful gas, vapor, or liquid generation. No treatment of the thorium waste stream was required to meet the WAC for this waste stream.

2.2.8 Etiologic Agents

Thorium wastes to be shipped to the NTS shall not contain pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR 173.134. (NVO-325 (Rev.1), 5.5.1.1(G)).

Compliance Method The only significant source of potential etiologic agents on site is from medical services. Such materials may include band aids, tongue blades, syringes, cotton balls, outdated pharmaceuticals, or other materials stained with blood or other body fluids. These materials are managed according to Ohio Infectious Waste Law/Regulation (ORC 3734.021 and OAC 3745-27 through 25) which includes segregated packaging at the point of generation. Materials are placed in a red bag in a box premarked with the international biohazard label in accordance with procedure MS-C-011, "Medical Infectious Waste Management." These boxes are then transported by a registered transporter to a licensed treatment facility. These administrative controls prevent etiologic agents from entering the Thorium Residues waste stream. Reference FEMP Waste Characterization Plan, PL-3052(M-128) - Infectious Waste Section for additional evaluation criteria.

Infectious waste is addressed on completing the MEF (EW-0001). In addition, the Prohibited Materials list, which is posted at time of packaging (PT-0005, -0006, and -0007), includes "medical waste" under "Etiological Agents." This ensures no etiological waste, that may be present in the radiological controlled areas, are packaged for shipment to the NTS.

2.2.9 Chelating Agents

If a waste is determined to contain chelating agents above the one percent by weight limit, the waste shall not be approved for disposal at the NTS. (NVO-325 (Rev.1), 5.5.1.1(H)).

Compliance Method Chemicals from the on-site laboratory are materials that may potentially be classified as chelating agents. WCS has generated a list of potential chelating or complexing agents through an on-line database search and will consult this list to evaluate potential chelating or complexing agents.

Containers not meeting the criteria for shipment will be segregated from other waste being shipped for disposal at the NTS. Chelating agent content will be determined through the use of the NTS WAC checklist provided in the Waste Characterization Plan, PL-3052(M-128). This checklist is used in the process of completing the MEF (following EW-0001, Initiating Waste Characterization Activities Using the Material Evaluation Form) and will identify waste that contain chelating agents above one percent by weight.

2.2.10 Polychlorinated Biphenyls

PCB contaminated waste shall not be shipped for disposal at NTS in the thorium waste stream unless the PCB concentration meets the municipal solid waste disposal limits. See Title 40 CFR 761.60 for PCB disposal requirements. (NVO-325 (Rev.1), 5.5.1.1(I)).

Compliance Method The FEMP samples wastes for PCB contamination when a reason to suspect PCB contamination is provided by:

- (1) a likely waste matrix (e.g., oily material),
- (2) a review of previous operations,
- (3) a review of manufacturers manuals, or
- (4) previous sampling and analyses data.

This waste stream contains no oily material and no additional process knowledge exists to provide any reason to suspect PCB contamination. This determination is performed during the hazardous waste determination (EW-0001). Reference FEMP Waste Characterization Plan, PL-3052(M-128) - TSCA PCB Section 8 for evaluation criteria.

2.2.11 Explosives and Pyrophorics

The waste shall not contain potentially explosive or pyrophoric material in a form that may spontaneously combust if the container is breached. (NVO-325 (Rev.1), 5.5.1.1(J)).

Compliance Method This WAC is evaluated during the hazardous waste characterization. This evaluation is performed in accordance with EW-0001, Initiating Waste Characterization Activities Using the Material Evaluation Form (MEF) and FEMP Waste Characterization Plan, PL-3052(M-128). Any waste that potentially fails this WAC will be identified by WCS and the material will not be shipped to the NTS for disposal.

2.3 Waste Stream General Package Criteria

2.3.1 Design

Waste packaging criteria for thorium waste shipped to the NTS for disposal will meet DOT Regulations, 49 CFR 173, Subpart I. Standard operating procedures listed in Section III of the Waste Certification Program Plan, concerning storage and off-site shipments, will be used to assure that all shipments meet DOT requirements and NTS site-specific requirements.

2.3.2 Nuclear Safety

The quantity of radioactive materials in thorium waste shipped to the NTS will be limited so that an infinite array of packages will remain subcritical. This quantity will be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, and taking into account the actual materials in the waste. Material containing fissile isotopes shipped under this waste stream will be packaged to meet fissile packaging exceptions delineated in 49 CFR, part 173.453.

2.3.3 Nuclear Heating

In compliance with 49 CFR 173.442, Thermal Limitations, a Health Physics evaluation of waste packages of material to be shipped to the NTS from the FEMP will show no evidence of a heating effect above NVO-325 (Rev.1) limits from radiological decay. Calculations from these waste streams at the FEMP were made following SD-ES&H-BAS-3019, "Technical Basis for Calculating Nuclear Decay Heat Production from Packaged Radioactive Waste." The purpose of the technical basis is to demonstrate the process of determining nuclear heating in watts/kg. These calculations are based on the total alpha, beta, and gamma energy from each significant isotope in the waste and its associated daughters during normal radioactive decay.

2.3.4 Radiation Levels

In compliance with 49 CFR 173.441, Radiation Levels, the radiation exposure rate at the surface and at 1 meter from each package of thorium waste will be measured following procedure RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving" and recorded in the shipment data package. Thorium waste packages that exceed 200 millirem/hr on contact will not be shipped to NTS.

2.3.5 External Contamination

In compliance with 49 CFR 173.443, the surface contamination of each container will be measured using instruments calibrated by Environmental Safety & Health (ES&H), Dosimetry, Instrumentation Section and recorded in the data package. LLRW packages are shipped after meeting the FEMP's limits for radioactive material shipments stated in RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving." The FEMP's limits are more restrictive than 49 CFR 173.443. If decontamination below the FEMP limits for removable radioactivity are not met with reasonable efforts, the FEMP limits may be exceeded with the concurrence of Radiological Compliance. However, in no case will external contamination levels exceed the limits in 49 CFR 173.443.

2.3.6 Activity Limits

The activity limits of Titles 49 CFR 173.421, "Limited Quantities of Radioactive Materials," and 49 CFR 173.425, "Transport Requirements for Low-Specific Activity Radioactive Materials" shall be met.

In compliance with Title 49 CFR 173.421 and 173.425, strong, tight containers used for shipping Limited Quantities (LQ) and Low-Specific Activity (LSA) LLW will be constructed so they will not leak during normal transportation and handling conditions.

Two hundred boxes of thorium residue have U-233 levels averaging 13ppm and cannot be considered "LSA" as defined by 49 CFR 173.403(kk). An exception provided in 49 CFR 173.453(e) allows these containers to be shipped in accordance with 49 CFR 173.425. These packages, however, will not be marked "LSA."

2.3.7 Multiple Hazards

Not applicable, the FEMP will not ship thorium wastes with multiple hazards to the NTS.

2.4 **Waste Stream Specific Package Criteria**

2.4.1 Closure

All thorium waste package closures will be sturdy enough to ensure the closures will not be breached under normal handling conditions and will not serve as weak points for package failure.

2.4.2 Strength

Thorium waste will be packaged in containers capable of supporting a uniformly distributed load of 4,000 lbs/ft², except for waste packaged in DOE/NV approved containers (drums).

2.4.3 Handling

All Thorium waste containers will have permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar handling equipment. Lifting rings and other auxiliary lifting devices will be recessed, offset, or hinged in a manner that does not inhibit stacking the packages. The lifting devices will be designed to meet a 5:1 safety factor based upon the ultimate strength of the material. All rigging devices not permanently attached to the waste package will have a current load test based on 125 percent of the safe working load.

2.4.4 Size

In addition to standard 55 gallon and 85 gallon steel drums, the FEMP ships containers of thorium waste identified in Table I.

2.4.5 Weight

Compliance with the weight limits specified in NVO-325 is controlled by procedures for packaging waste in containers listed in Section VI of this application. The FEMP maintains a net weight of 882 pounds per drum. The weight limits for other containers are provided in Table I. Containers of thorium residues exceeding the limits specified in Table I will be handled as specified in Section 2.8.1 below.

2.4.6 Loading

Thorium waste will be packaged to ensure that the interior volume is as efficiently and compactly loaded as practical.

2.4.7 Nonstandard Type A Packaging

The FEMP is currently using a strong, tight container that has been tested to Type 7A Container specifications. Used for this purpose, the container does not require a DOT Type A Certification. If a Type A Container is required to ship thorium waste, only containers with a DOT Type A Certification will be used.

2.4.8 Package Protection

Every FEMP thorium waste package will be prepared for shipment so as to minimize damage during transit. The pre-shipment storage environment will be controlled to avoid adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. FEMP will take all responsibility for pre-shipment storage and take all reasonable precautions to preclude the accumulation of moisture on or in packages prior to their arrival to the NTS. Tamper indicating devices are used to maintain control of the container contents once certification actions are completed.

The FEMP will package all thorium waste for shipment to NTS in containers meeting DOT requirements (containers meeting HM 181 specifications). All containers will be shipped to meet DOT requirements for interstate travel and will meet the requirements of 49 CFR 173.411, 173.421, and 173.425.

2.4.9 Marking and Labeling

Thorium waste shipped to the NTS will be marked and labeled as required in Title 49 CFR 172, Subparts D and E [with exceptions noted in Title 173.425 (b) and (c)]. Also, each waste container will be marked with a unique six character container identification number and eight character shipment number per NVO-325 (Rev.1), 5.5.1.3(I,3) so that the container can be identified from another container within the shipment or from another set of containers. The approved 13 digit waste stream number (ONLO000000012) will also be placed onto the waste container. The thorium waste packages will be marked and labeled as radioactive material. The weight of the package will be marked in pounds and kilograms. Signed NV-211 labels will be attached to containers certified for shipment to the NTS.

2.4.10 Barcoding

Barcode labels will meet NVO-325 (Rev.1) requirements and must be approved by DOE/NV prior to use. A minimum of two barcode labels will be placed near the top and on opposite sides of each thorium waste package. A third label may be applied to one end of bulk containers, or on top of 4'x 4'x 7' metal boxes. Barcode Labels on drums will be placed on the lid and one side near the top of the drum.

2.4.11 On-site Transfer

Only packaged thorium waste is shipped from the FEMP for disposal at the NTS. The FEMP will not provide any material which will require on-site transfer of unpackaged bulk materials by the NTS.

2.5 Additional Criteria for Mixed Waste

None of the waste streams listed in this application are mixed waste. The FEMP will not be disposing of mixed waste at the NTS.

2.6 Additional Criteria for Transuranic/Transuranic Mixed Waste

None of the waste streams listed in this application contain Transuranic or Transuranic Mixed waste. The FEMP will not be disposing of Transuranic or Transuranic Mixed waste at the NTS.

2.7 Additional Criteria for Bulk Waste

The FEMP is not currently and does not intend to ship Thorium Residue waste to the NTS for disposal. By default, the FEMP will not be shipping mixed waste as bulk waste or mixed waste for bulk disposal.

2.8 Additional Criteria for Case-by-Case Waste

2.8.1 Weight

The FEMP is currently shipping thorium waste in 55-gallon drums, 85-gallon drums, and metal boxes identified in Table I. Thorium box containers will typically not weigh more than 9,000 pounds and require either a large fork truck or crane for removal from the transport vehicle. The FEMP will obtain approval from NTS prior to shipment of any other container listed in Table I exceeding the 9,000 pound limit. All containers weighing more than 9,000 pounds will be shipped on flat bed trailers or vans with removable sides or tops.

2.8.2 Activity Limits

All containers shipped from the FEMP for disposal at the NTS are within the activity limits specified in NVO-325 (Rev.1), Section 5.5.1.2.F.

2.8.3 Radioactively Contaminated Asbestos

Friable asbestos will not be shipped to the NTS before securing DOE/NV approval. None of the waste included in this waste stream contains radioactively contaminated regulated asbestos.

2.8.4 DOE Comparable Greater-Than-Class-C As Defined in 10 CFR 61.55

This requirement is not applicable to the FEMP waste streams since no greater-than-Class-C waste is shipped from the FEMP for disposal at NTS.

2.8.5 Classified Waste Streams

This requirement is not applicable, the FEMP will not ship classified waste for disposal at the NTS under this waste stream.

2.8.6 Radioactive Animal Carcasses

This requirement is not applicable to the FEMP waste streams. No radioactive animal carcasses are included in the thorium waste stream. This requirement is intended to address waste streams that include radioactively contaminated laboratory test animal carcasses. The animals (birds and small mammals) from the contaminated area that may intermittently appear in FEMP waste streams are not subject to this requirement.

2.8.7 Other Waste Forms

The FEMP will secure DOE/NV approval for any waste forms that do not meet the criteria included in this waste stream Information section before shipping to the NTS.

2.9 Packaging and Shipping Information

Thorium residues will be packaged and shipped according to the DOT requirements for Radioactively material, LSA, n.o.s.

The two hundred boxes with high U-233 content will be shipped according to the DOT requirements for radioactively contaminated material (n.o.s. Class 7, UN-2982).

2.10 Waste Security Information

This section is not applicable since. No classified waste will be shipped to the NTS in this waste stream.

Nevada Test Site Waste Profile, Revision 0

A. Generator Information

1. WCO Michael F. Ramirez Phone (513) 648-5668 FAX (513) 648-5701
 2. Technical Contact Dayne A. Thomas Phone (513) 648-5672 FAX (513) 648-5649
 3. DOE Contact David M. Rast Phone (513) 648-3138 FAX (513) 648-3077
 4. Facility Name Fernald Environmental Management Project
 Address P.O. Box 398704
 City Cincinnati State Ohio Zip 45239-8704
 5. EPA Identification Number OH6890008976

B. General Waste Stream Information

1. Waste Stream Identification Number ONLO000000015
 Profile Revision Number 99 Profile Revision Date 9/04/97
2. Title of Waste Stream Treated Uranium Residues
3. Waste Category ☒ Low-Level ☐ Mixed Low-Level (Generated within Nevada only)
4. Generating Process Description
See Waste Stream Characterization Data Sheets Attached
- Process Description Continuation Page Attached ☒ Yes ☐ No
 Flow Diagram Attached ☐ Yes ☒ No
5. Estimated Rate of Generation ☒ One Time Only 70 m³
☐ Ongoing _____ m³/yr
6. Reason for Submittal (specify one)
☐ New Waste Stream
☐ Modification to Waste Stream Date Change Effective _____
☐ Terminate Waste Stream
☒ Profile for currently Approved Waste Stream
7. ☒ Yes ☐ No Does this waste stream require a WAC deviation? Attach information.

J. WASTE STREAM IDENTIFICATION NUMBER ONL0000000015**Stabilized Treated Wastes****1.0 Waste Type****Low Level Waste****2.0 Waste Description**

A waste stream is defined as a waste which is categorized by similar characterization process and/or point of generation. The criteria used for evaluating candidate LLW for shipment to the NTS, excerpted from the FEMP Waste Characterization Plan, PL-3052(M-128), are described on the following pages.

2.1 Stabilized Treated Wastes

Radioactively contaminated wastes, that would not meet the NVO-325 (Rev.1) 5.5.1.1(B) waste acceptance criteria, without treatment for disposal at the NTS. These wastes have been characterized by WCS and may include the following materials that are identified as hazardous waste in 40 CFR 261:

- Paint chips and debris off of building structures and equipment surfaces,
- Grit and shot blast used to strip paint from surfaces,
- Dried chemical residues used to clean surfaces,
- Solidified furnace salts,
- Sump cakes,
- Construction rubble,
- Soil, and
- Miscellaneous trash.

These materials contain levels of heavy metals and organic compounds in its pretreatment form that categorize it as a hazardous waste. These wastes are generated during removal actions, maintenance, and recycling projects. The wastes that have been characterized as having metals contamination and do not meet the disposal criteria are stored for stabilization treatment.

Full scale treatment consists of cement (or like stabilizer) stabilization of the mixed waste rendering the finished product to be a Low-Level Radioactive Waste (LLRW). The finished product must pass a Toxicity Characteristic Leaching Procedure (TCLP) analysis and meet the Waste Acceptance Criteria (WAC) for disposal at Nevada Test Site (NTS). The finished form is in 2'x 4'x 7' white metal boxes for shipment to NTS. Waste Certification is performed by FERMCO and is consistent with the requirements of the Nevada Test Site Waste Acceptance Criteria. FERMCO is responsible for analyzing the samples in order to certify that the treated residues meet the NTS WAC for disposal.

Stabilization activities are performed on the FEMP site by a subcontractor. The activities are performed as described in the FERMCO RM-0012 QA Program which includes:

- Procurement of services and equipment,
- Personnel training and qualifications,
- Work performance,
- Design,
- Inspection and acceptance testing, and
- Documents and records.

Each activity is specified in the Request for Proposal (RFP) when acquiring a subcontractor. Their ability to perform these activities is evaluated during a pre-award audit. In addition, the workplan is audited before any activities begin. Compliance to requirements is verified with comprehensive sampling and analysis after treatment and before shipment.

2.1.1 WASTE STREAM CHARACTERIZATION DATA SHEET

2.1.1.1 Waste Stream No.: 0 N L 0 0 0 0 0 0 0 1 5

1. Waste Description:

a. Physical Characteristics:

Paint chips and debris from building structures and equipment surfaces, grit and shot blast, furnace salts, sump cakes, construction rubble, and miscellaneous trash solidified in cement.

b. Special Handling/Disposal Requirements:

This material has an average radioactive level on contact of 2.0 mrem/hr. with a range of <0.5 mrem/hr. to 10.0 mrem/hr. Time, distance, and shielding techniques should be employed to reduce exposure.

2. Basis for Characterization:

a. Process Knowledge:___ b. Analytical Knowledge:___ c. Both: ☒

If b or c, provide Standard Data Reporting Forms as necessary.

NOTE: Waste characterization of materials included in this waste stream is completed using a combination of sampling and analysis and process knowledge. Process knowledge is used when the material meets one or more of the criteria of NVO-325 (Rev.1), Section 4.1.1.A, B, and C or when process controls are well documented and controlled. The FEMP will conduct comprehensive sampling of treated waste streams before shipping for disposal at the NTS. Sampling and analysis will be conducted on each batch of solidified waste to confirm that the waste is not hazardous as defined in 40 CFR 261.

3. Radioactive Characteristics:

a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: No

b. WMIS Nuclide Category (circle): 1 (2) 3 4 5 NA 7 8
(Choose the highest predominate nuclide. The number 6 is not an option.)

c. Radioactive Constituents:

Specific Activity Range of Waste Stream

<u>Nuclide</u>	<u>Chemical Forms</u>	<u>Low</u>	<u>Mean</u>	<u>High</u>	<u>Units</u>
(1) U-238	*	2.0E-07	4.0E-05	2.0E-04	Ci/kg
(2) U-236	•	0.0	4.0E-06	2.4E-05	Ci/kg
(3) U-235	*	2.6E-09	1.6E-06	1.3E-05	Ci/kg
(4) U-234	•	8.4E-08	3.8E-05	2.6E-04	Ci/kg
(5) Tc-99	oxides	0.0	1.1E-06	6.0E-06	Ci/kg
(6) Np-237	oxides	0.0	2.0E-08	3.2E-07	Ci/kg
(7) Pu-238	oxides	0.0	6.0E-09	1.2E-07	Ci/kg
(8) Pu-239	oxides	0.0	4.0E-08	1.0E-06	Ci/kg
(9) Pu-241	oxides	0.0	1.3E-06	2.4E-05	Ci/kg
(10) Sr-90	oxides	0.0	6.0E-08	4.1E-07	Ci/kg

• Uranium oxides and salts (typically UO_3 , U_3O_8 , and UF_4)

NOTE: The activities presented on this Waste Characterization Data Sheet were obtained by a weighted average of sub-waste streams of ONLO000000006 times 0.6 (to account for the stabilization material - usually cement) to determine the "Mean" and by reporting the maximum activities observed or derived for individual samples among the sub-waste streams for the "High." NO RELATIONSHIPS BETWEEN THE ISOTOPES ARE IMPLIED OR CAN BE ASSUMED FROM THESE REPORTED ACTIVITIES. (The sub-waste streams are: low grade/depleted, high grade/depleted uranium metal, high grade/depleted residues, and low grade/enriched residues.)

4. Hazardous Components (for MW): **NOT APPLICABLE**

a. Basis for Identifying as MW (circle):

(1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

<u>EPA Hazardous Waste Number</u>	<u>Chemical Name</u>	<u>Treatment Performed</u>	<u>Regulatory Threshold/Treatment Standard</u>
(1)			
(2)			

2.2 Waste Stream Specific Criteria

2.2.1 Low-Level Waste

Only the stabilized waste defined as LLW per DOE Orders 5820.2A, 5400.1, and 5480.11 guidelines shall be shipped to the NTS. (NVO-325 (Rev. I), 5.5.1)..

Compliance Method All the waste for stabilization originated from the controlled area at the FEMP or are contaminated by-products of cleaning processes used in treating these waste materials. Materials from controlled areas at the FEMP are considered radioactive waste unless demonstrated otherwise through analysis or administrative controls. Further guidance on radioactive waste characterization is provided in the DOE Performance Objective (Draft). In accordance with the "Waste Minimization and Pollution Prevention Awareness Plan," the FEMP attempts to minimize waste generation whenever possible.

2.2.2 Transuranics

Stabilized wastes shall have a TRU concentration less than 100 nCi/g (i.e., shall not be regulated as TRU waste). (NVO-325 (Rev.1), 5.5.1.1(A)).

Compliance Method MC&A records indicate there are no materials at the FEMP with TRU isotope concentrations above the 100 nCi/g level. The high grade enriched nuclear material (which is not currently included in this waste stream but may be declared waste in the future) contains the highest levels of TRU isotopes. The highest concentration for any single TRU isotope in this material is estimated at 1.6 nCi/g and the sum of the highest detected levels of Np-237 + Pu-238 + Pu-239/240 + Am-241 = 2.8 nCi/g.

The Stabilized Treated Wastes are generated by Operable Unit 3 (OU3) which sampled the waste for radiological characterization. The isotopic content is reported in the OU3 Remediation Investigation / Feasibility Study (RI/FS) report. Transuranic content for all samples of this waste stream were less than 1 nCi/g.

2.2.3 Hazardous Waste

All stabilized waste shall be evaluated for hazardous waste analytically and/or identified as hazardous if any component is listed in Title 40 CFR 261, "Identification and Listing of Hazardous Waste," or in the regulations of the state where the waste is generated. (NVO-325 (Rev.1), 5.5.1.1(B)).

Compliance Method Waste that are identified as hazardous based on 40 CFR 261 are not prepared for shipment to NTS. This describes the waste that is stabilized for this waste stream. Heavy metal content, particularly lead, and organics, such as grease and oil scum, have kept this waste from passing the NVO-325 (Rev.1) 5.5.1.(B) WAC. The sampling and analysis was directed by WCS using the FEMP Sampling and Analysis Program approval process described in a DOE/NV memorandum, FEMP Low-Level Waste Sampling and Analysis Program Review, received at the FEMP April 21, 1993.

Sampling of the stabilized waste is performed, before the cement sets for each batch, following an approved SAP referenced in the workplan. Any batch of solidified waste that does not have analytical data demonstrating that the hazardous waste is immobilized, is appropriately tagged and documented with a DR and is not shipped to NTS. Whenever possible, this waste will be re-treated and re-analyzed as directed by nonconformance corrective action of the workplan.

2.2.4 Free Liquids

Stabilized waste disposed at NTS waste management sites shall contain as little free liquids as is reasonably achievable, but in no case shall the liquid equal or exceed 0.5 percent by volume of the external waste container and shall meet the NVO-325 (Rev.1), 5.5.1.1(C) criteria.

Compliance Method All water in the solidification mix is part of the cement matrix. Confirmation of the absence of free liquid is done visually when the box lids are bolted closed after the cement has set (water will migrate to the top of the container). Any water will be removed or absorbed following 20-C-640, "Liquid Removal from Containerized LLRW."

The containerized stabilized wastes are protected from the elements during storage to minimize any contact with water in accordance with PT-0003, "Control and Movement of Containers at the FEMP."

2.2.5 Particulates

Wastes containing greater than 1 weight percent fine particulate materials less-than-ten-micrometer-diameter or 15 weight percent less-than-200 micrometer diameter particles shall be immobilized or packaged in accordance with NVO-325 (Rev.1), 5.5.1.1(D).

Compliance Method The stabilized waste stream meet this NVO-325 (Rev.1), WAC requirement based on the nature of its solid matrix. It is packaged in metal boxes, following the task order and/or procedures PT-0005 and PT-0006, to contain particles that may break off.

2.2.6 Gases

Gases shall be stabilized or absorbed so that pressure in the waste package does not exceed 1.5 atmospheres at 20° Celsius. Since only granular waste materials are solidified under the workplan, no aerosol cans or compressed gas cylinders will be present. (NVO-325 (Rev.1), 5.5.1.1(E)).

Compliance Method The stabilized waste stream always meets this NVO-325 (Rev.1). In no case will the stabilized waste produce pressure in the package greater than 1.5 atmospheres at 20° Celsius.

2.2.7 Stabilization

Where practical, stabilized waste shall be treated to reduce volume and provide a more structurally and chemically stable waste form. (NVO-325 (Rev.1), 5.5.1.1(F)).

Compliance Method The stabilized/solidified waste form provides a matrix to immobilize hazardous constituents. This provides a more structurally stable form that can be accepted at the NTS. To stabilize the waste, cement and water are added which increase the volume by approximately 50 percent. The adequacy of the stabilization will be verified visually when the box is closed after solidification and by evaluation of the solidified sample taken from each batch before it solidified.

2.2.8 Etiologic Agents

Stabilized wastes to be shipped to the NTS shall not contain pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR 173.134. (NVO-325 (Rev.1), 5.5.1.1(G)).

Compliance Method The only significant source of potential etiologic agents at the FEMP site is from medical services. Syringes and other metal devices can come from this area. The dry nature of the material to be stabilized and the solidification process, which will destroy any etiologic agents, does not allow for any microbial activity. No pathogens, infectious wastes, or other etiologic agents as defined in Title 49 CFR 173.134 exists in this waste stream shipped to NTS.

2.2.9 Chelating Agents

If a waste is determined to contain chelating agents above the one percent by weight limit, the waste shall not be approved for disposal at the NTS. (NVO-325 (Rev.1), 5.5.1.1(H)).

Compliance Method Laboratory chemicals are not part of this waste stream. None of the wastes that are solidified, such as paint chips, furnace salts, grit, and shot blast, exhibit chelating agent properties. The solidification process will make any possible coordination sites unavailable and provide a more stable waste form with reduced leachability.

2.2.10 Polychlorinated Biphenyls

PCB contaminated waste shall not be shipped for disposal at NTS in the stabilized waste stream unless the PCB concentration meets the municipal solid waste disposal limits. See Title 40 CFR 761.60 for PCB disposal requirements. (NVO-325 (Rev.1), 5.5.1.1(I)).

Compliance Method The FEMP samples wastes for PCB contamination when the waste matrix (e.g., oily material) or review of previous operations, manufacturers manuals, and previous sampling and analyses provides a reason to suspect PCB contamination. This determination is performed during the waste characterization by WCS. Reference FEMP Waste Characterization Plan, PL-3052(M-128) - TSCA PCB Section 8 for evaluation criteria.

PCB contaminated waste is not anticipated with this waste stream. However, if PCB contamination is suspected, sampling and analysis of the final waste form will be performed. TSCA PCB regulated waste will not be shipped to the NTS.

2.2.11 Explosives and Pyrophorics

Stabilized waste shall not contain potentially explosive or pyrophoric material in a form that may spontaneously combust if the container is breached. (NVO-325 (Rev.1), 5.5.1.1(J)).

Compliance Method None of the materials that comprise the basic waste stream, including the metal oxides, are considered explosive or pyrophoric.

2.3 Waste Stream General Package Criteria

2.3.1 Design

Waste packaging criteria for stabilized waste shipped to the NTS for disposal will meet DOT Regulations, 49 CFR 173, Subpart I. Standard operating procedures listed in the Waste Certification Plan, Appendix I, concerning storage and off-site shipments, will be used to assure that all shipments meet DOT requirements and NTS site-specific requirements.

2.3.2 Nuclear Safety

The quantity of radioactive materials in stabilized waste shipped to the NTS will be limited so that an infinite array of packages will remain subcritical. This quantity will be determined on the basis of a specific nuclear safety analysis, considering credible accident situations, or by taking into account the actual materials in the waste. Material containing fissile isotopes shipped under this waste stream will be packaged to meet fissile packaging exceptions delineated in 49 CFR, part 173.453. Stabilized wastes are typically excepted from fissile packaging requirements by one of the following criteria:

- Uranium enriched U-235 not greater than one percent by weight with the total mass of plutonium and U-233 not to exceed one percent of the mass of U-235 in any package. The fissile material will be homogeneously distributed throughout the package contents and must not form a lattice arrangement within the package.
- Not more than 5 grams of fissile radionuclides in any 10-liter volume. The material will be packaged so as to maintain this limit of fissile radionuclide concentration during normal transportation.

2.3.3 Nuclear Heating

In compliance with 49 CFR 173.442, Thermal Limitations, a Health Physics evaluation of waste packages of material to be shipped to the NTS from the FEMP will show no evidence of a heating effect above NVO-325 (Rev.1) limits from radiological decay. Calculations from these waste streams at the FEMP were made following SD-ES&H-BAS-3019, "Technical Basis for Calculating Nuclear Decay Heat Production from Packaged Radioactive Waste." The purpose of the technical basis is to demonstrate the process of determining nuclear heating in watts/kg. These calculations are based on the total alpha, beta, and gamma energy from each significant isotope in the waste and its associated daughters during normal radioactive decay.

2.3.4 Radiation Levels

In compliance with 49 CFR 173.441, Radiation Levels, the radiation exposure rate at the surface and at 1 meter of each package of stabilized treated waste will be measured following procedure RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving" and recorded in the shipment data package. Stabilized waste packages that exceed 200 millirem/hr on contact will not be shipped to NTS.

2.3.5 External Contamination

In compliance with 49 CFR 173.443, the surface contamination of each container will be measured using instruments calibrated by Environmental Safety & Health (ES&H), Dosimetry, Instrumentation Section and recorded in the data package. LLRW packages are shipped from the FEMP after meeting the FEMP's limits for radioactive material shipments stated in RC-RDA-006, "Radiological Survey Requirements for Radioactive Material Shipping and Receiving." The FEMP's limits are more restrictive than 49 CFR 173.443. If decontamination below the FEMP limits for removable radioactivity are not met with reasonable efforts, the FEMP limits may be exceeded with the concurrence of Radiological Compliance. However, in no case will external contamination levels exceed the limits in 49 CFR 173.443.

2.3.6 Activity Limits

The activity limits of Titles 49 CFR 173.421, "Limited Quantities of Radioactive Materials," and 49 CFR 173.425, "Transport Requirements for Low-Specific Activity Radioactive Materials" will be met.

In compliance with Title 49 CFR 173.421 and 173.425, strong, tight containers used for shipping Limited Quantities (LQ) and Low-Specific Activity (LSA) LLW will not leak during normal transportation and handling conditions.

2.3.7 Multiple Hazards

Not applicable. The FEMP will not ship wastes in this waste stream with multiple hazards to the NTS. Treatment will remove any multiple hazards that may be associated with this waste stream.

2.4 Waste Stream Specific Package Criteria

2.4.1 Closure

All stabilized waste package closures will be sturdy enough to assure the closures will not be breached under normal handling conditions and will not serve as weak points for package failure.

2.4.2 Strength

Stabilized waste will be packaged in containers capable of supporting a uniformly distributed load of 4,000 lbs/ft², except for waste packaged in DOE/NV approved containers (drums).

2.4.3 Handling

All stabilized waste containers will have permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar handling equipment. Lifting rings and other auxiliary lifting devices will be recessed, offset, or hinged in a manner that does not inhibit stacking the packages. The lifting devices will be designed to meet a 5:1 safety factor based upon the ultimate strength of the material. All rigging devices that are not permanently attached to the package will have a current load test based on 125 percent of the safe working load.

2.4.4 Size

In addition to standard 55 gallon and 85 gallon steel drums, the FEMP ships containers of stabilized wastes identified in Table I or NVO-325, Appendix E.

2.4.5 Weight

Compliance with the weight limits specified in NVO-325 is controlled by procedures for packaging waste in containers listed in Section VI of this application. The FEMP maintains a net weight of 882 pounds per drum. The weight limits for other containers are provided in Table I. Containers of stabilized waste exceeding the limits specified in Table I will be handled as specified in Section 2.8.1 below.

2.4.6 Loading

Stabilized waste will be packaged to ensure that the interior volume is as efficiently and compactly loaded as practical.

2.4.7 Nonstandard Type A Packaging

The FEMP is currently using a strong, tight container that has been tested to Type 7A specifications. Used for this purpose, the container does not require a DOE Type A Certification. If a Type A Container is required to ship vitrified silo residues, only containers with a DOE Type A Certification will be used.

2.4.8 Package Protection

Every stabilized waste package will be prepared for shipment so as to minimize damage during transit. The pre-shipment storage environment will be controlled to avoid adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. The FEMP will take all responsibility for pre-shipment storage and take all reasonable precautions to preclude the accumulation of moisture on or in packages prior to their

arrival to the NTS. Tamper indicating devices are used to maintain control of the contents once certification actions are completed.

All stabilized waste packaged for shipment to NTS in containers will meet DOT requirements (Table I describes containers). All containers will be shipped to meet DOT requirements for interstate travel and will meet the requirements of 49 CFR 173.411, 173.421, and 173.425.

2.4.9 Marking and Labeling

Stabilized waste shipped to the NTS will be marked and labeled as required in Title 49 CFR 172, Subparts D and E (with exceptions noted in Title 173.425 (b) and (c)). Also, each waste container will be marked with a unique six character container identification number and eight character shipment number per NVO-325 (Rev.1), 5.5.1.3(l,3) so that the container can be identified from another container within the shipment or from another set of containers. The approved 13 digit waste stream number (ONL0000000015) will also be placed on the waste container. The package weight will be marked in pounds and kilograms. Signed NV-211 labels will be attached to containers certified for shipment to the NTS.

2.4.10 Barcoding

Barcode labels will meet NVO-325 (Rev.1) requirements and must be approved by DOE/NV prior to use. A minimum of two barcode labels will be placed near the top and on opposite sides of each stabilized waste package. A third label may be applied to one end of bulk containers, or on top of 2'x 4'x 7' or 4'x 4'x 7' metal boxes. Barcode Labels on drums will be placed on the lid and one side near the top of the drum.

2.4.11 On-site Transfer

Only packaged waste is shipped from the FEMP for disposal at the NTS. The FEMP will not provide any material which will require on-site transfer of unpackaged bulk materials by the NTS.

2.5 Additional Criteria for Mixed Waste

None of the waste streams listed in this application are mixed waste. The FEMP will not be disposing of mixed waste at the NTS. Any treated waste that was characterized as mixed waste will be followed to verify the treatment removed the characteristics prior to shipment to the NTS.

2.6 Additional Criteria for Transuranic/Transuranic Mixed Waste

None of the waste streams listed in this application contain Transuranic or Transuranic Mixed waste. The FEMP will not be disposing of Transuranic or Transuranic Mixed waste at the NTS.

2.7 Additional Criteria for Bulk Waste

The FEMP does not currently ship bulk LLW residues to the NTS. All wastes shipped from the FEMP will be containerized for disposal as identified in Sections E.2.4.d and E.2.4.e of this application. Therefore, the FEMP will not be shipping bulk LLW residues for disposal at the NTS.

2.8 Additional Criteria for Case-by-Case Waste

2.8.1 Weight

The FEMP is currently shipping and intends to continue to ship waste containers within the limits specified in Table I. The FEMP will obtain approval from NTS prior to shipment of any container listed in Table I exceeding the 9,000 pound limit. All containers weighing more than 9,000 pounds will be shipped on flat bed trailers or vans with removable sides or tops.

2.8.2 Activity Limits

All containers shipped for disposal at the NTS are within the activity limits specified in NVO-325 (Rev.1), Section 5.5.1.2.F.

2.8.3 Radioactively Contaminated Asbestos

Friable asbestos will not be shipped to the NTS before securing DOE/NV approval. This waste stream does not contain radioactively contaminated regulated asbestos.

2.8.4 DOE Comparable Greater-Than-Class-C As Defined in 10 CFR 61.55

This requirement is not applicable to the FEMP waste streams since no greater-than-Class-C waste is shipped from the FEMP for disposal at NTS.

2.8.5 Classified Waste Streams

This requirement is not applicable, the FEMP will not ship classified waste for disposal at the NTS under this waste stream.

2.8.6 Radioactive Animal Carcasses

This requirement is not applicable to the FEMP waste streams. No radioactive animal carcasses are included in the stabilized waste stream. This requirement is intended to address waste streams that include radioactively contaminated laboratory test animal carcasses. The animals (birds and small mammals) from the contaminated area that may intermittently appear in FEMP waste streams are not subject to this requirement.

2.8.7 Other Waste Forms

The FEMP will secure DOE/NV approval for any waste forms that do not meet the criteria included in this waste stream Information section before shipping to the NTS.

2.9 Packaging and Shipping Information

Stabilized Waste will be packaged and shipped according to the DOT requirements for Radioactive material, LSA, n.o.s.

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2.10 Waste Security Information

This section is not applicable. No classified waste will be shipped to the NTS in this waste stream.